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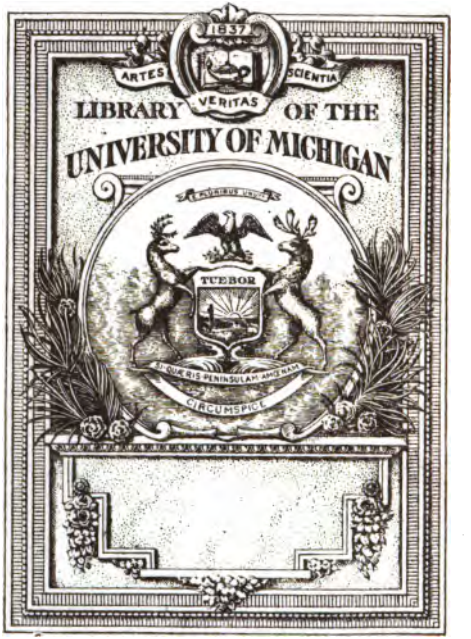
TRENCH FIGHTING

CAPT. F. H. ELLIOTT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TRENCH FIGHTING

TRENCH FIGHTING

BY

CAPTAIN F. HAWS ELLIOTT

British Expeditionary Force

WITH DIAGRAMS AND ILLUSTRATIONS

BOSTON AND NEW YORK
HOUGHTON MIFFLIN COMPANY
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TRENCH FIGHTING

I

HISTORY AND PRELIMINARY ENTRENCHING

MANY people are under the impression that the use of trenches in warfare is a comparatively new thing. As a matter of fact, trenches in some crude form have been used almost since the Stone Age, and while they have attained very great improvement in this war, yet we find in history that Cæsar made use of trenches in his wars on the Gauls, and even before that the instinct of primeval man when he was hunted was to take cover in the earth. Therefore, when we modern soldiers take advantage of the earth for protection we are simply following instinct.

In the Spanish-American War trenches of a kind were used; it is true that they were not of a very elaborate nature, but still they afforded protection, although as a rule the Spanish-American War could be described as open warfare.

Again, in South Africa trenches were used, but

they were rather shallow shelter pits, having none of the ramifications or improvements of the modern trench.

Again, in the Russo-Japanese War, trenches were used, and in this war barbed-wire entanglements played a considerable part.

To come down to the present day, all soldiers of all countries are taught that the object of a soldier in a battle is to press home in the quickest possible way to the final assault; that is, to get at close grips with the enemy and despatch him with the bayonet.

The official handbook of one of our noted military Powers in 1913 described this assault as follows: "A soldier should only dig in (entrench) as a last resource, and then only hold such position until reserves can be brought up to strengthen the attacking line so that it could go forward and deliver the assault." This idea was tried in Europe at the beginning of the war with most disastrous effects to those troops who tried it, because of the tremendously effective fire of modern artillery and machine guns. It was found that such huge numbers of men, machine guns, and artillery were used that a different method of warfare must also be used.

The Germans were driving the French and

British back through France and Belgium, and the Germans had a tremendous superiority both in artillery and infantry. The Retreat from Mons, the Battle of the Marne, and the first and second Battles of Ypres will stand forth in history forever as examples of the glorious feats of the British and French soldiers against an overwhelming superiority of artillery and infantry, and the final stopping of the German hordes in their mad rush on Paris was brought about by the wonderful bravery of these troops, and the more intense use of trench warfare.

The infantryman under the old open-warfare instructions proceeded as close as he could to the enemy, and, when overwhelmed by a superiority of fire, chose what natural cover he could and there dug a shelter pit for himself with his entrenching tool. This shelter pit was about one foot deep, eighteen inches wide, and six feet long, the end facing toward the enemy with all the earth that was excavated thrown out in front or to the front sides of the pit.

The men of the skirmish line, having dug themselves in, endeavored to hold this position until nightfall, when the officer in command would line up these individual positions, and have his men dig a shallow trench three feet wide and three

feet deep, using as much of the excavated ground as possible and lining out fire bays eighteen feet long, alternating with traverses nine feet wide and eight feet from front to rear, all the excavated earth from this trench being thrown toward the enemy so as to form a parapet and offer more protection.

The next stage is to improve this trench so as to make it possible for men to live in it. Consequently the top of the trench is widened to five feet, the earth being excavated from the rear side of the trench, and in the rear of the bottom of the newly widened trench a passageway is dug one and one half feet wide and one and one half feet deep. The earth excavated from this improvement is divided, throwing equal amounts to front and rear. Considerable slope must be made in the sides of this trench so that it will not cave in.

The reason that we do not make the fire trench in a continuous straight line is that modern artillery fire is far more effective when enfiladed; that is, when directed in a diagonal direction. Consequently, in order to protect the men in the trench it is necessary that we should interpose numerous blocks of earth, or, as we know them, "traverses." A traverse is a change in direction of the trench, curving to the rear, and consists of

a block of earth nine feet from left to right and eight feet from front to rear. The intervening spaces between traverses are known as "fire bays." By building a trench in this way a shell arriving from left or right has the effect of killing only the men in the fire bay over which it explodes.

It is necessary that some form of protected passage must be dug in order that the front line which we have thus built will have communication with the supports and reserves. Consequently we build deep, narrow communication trenches. These trenches usually consist of passages with fairly vertical walls, the dimensions being five feet below the surface of the ground and three feet wide, the earth excavated being thrown on both sides, but as a rule a larger quantity being thrown on the exposed side, that is, the side nearest the enemy. It is necessary that these communication trenches should wind or be very crooked; that is, there should not be a straight section longer than forty feet. No turn in a communication trench should have a smaller angle than ninety degrees, and the general direction of this winding trench should be so located, if possible, that a space of one hundred and fifty yards at least should intervene before

the direction again comes in line with the communication trench in front; because we must remember the forward effect of the shell is about one hundred and fifty yards, and a trench should be so designed that a shell exploding over it will have purely local effect.

Many important points are necessary when there is a choice about locating a front-line trench. We should take into consideration, *first*, the field of fire for that trench; that is, the amount of territory directly in front of the proposed trench that can be covered effectively by rifle fire from the garrison of that trench. Next, whether the position is specially protected from enemy shell fire, and if not, whether a near position would be more suitable. Also the question of drainage must be carefully considered, because in the winter time this will be a most important matter.

The old idea of concealing a trench, or siting a trench so that it will be concealed, has been practically abandoned, as it is recognized that photographs taken from an aeroplane will show up distinctly the location of a trench no matter how well it is concealed.

The use of covered fire trenches has been discontinued. In fact, it is absolutely forbidden,

because it has been found that the garrisons of such a trench in the event of an attack are practically defenceless. It also is a great obstruction in making an attack from our own trenches. Trenches should be sited as near to the enemy as possible, taking the above considerations into account.

In constructing a trench always build the parados nine inches to one foot higher than the parapet. The parados is the earth which is thrown up on the rear side of the trench.

The dimensions of the ordinary trench are as follows:

Depth from surface of ground to top of fire step, 3 feet to 3 feet 6 inches.
Depth from fire step to bottom of passageway, 1½ to 2 feet.
Width of fire step, 1½ feet.
Width of passageway, 1½ to 2 feet.
Width of trench at surface of ground, 5 feet.
Height of parapet above ground, 1½ to 2 feet.
Thickness of parapet from front to rear, not less than 5 feet, preferably as much more as possible.
Height of parados — 9 inches to 1 foot higher than parapet.

Thickness of parados, 3 to 4 feet.
Width of trench around traverse, 3 feet.
Depth of trench around traverse, $4\frac{1}{2}$ to 5 feet from surface of ground.

Front-line trenches on the forward slope of a hill are exposed to enemy view, and therefore to bombardment. On the other hand, the occupation of higher ground than the enemy lends a certain amount of morale superiority to our troops, and on account of the facility with which aeroplane photographs can be taken of trenches it is doubtful whether any disadvantage occurs from locating in such a position.

All buildings near a line of trenches should be demolished. Should there be good cellars in such buildings, and if they are located in a commanding position, these cellars will be found, with very little improvement, to be ideal strong points.

Locating a line of trenches through woods will to a certain extent lend concealment, and has the advantage that your barbed wire will probably be undestroyed by any preliminary bombardment which the enemy may deliver. On the other hand, it has the disadvantage that you have practically no field of fire, which is of vital importance, and it may be necessary to thin out

such woods so as to gain an unobstructed view for at least thirty or forty yards. Such a trench should be well protected at night by patrols and listening-posts.

It is not advisable to locate a section of trench immediately upon the edge of a wood, but about fifty to sixty yards inside a wood will be sufficient. By frequent patrols of fairly large numbers a domination of "No Man's Land" in the wood should be maintained.

II

STYLES OF TRENCHES AND STRONG POSTS

THERE are numerous styles of trenches in use at the present time. The one generally recognized as the standard trench is that having fire bays eighteen or twenty feet long with traverses intervening. This trench, while generally used in France, is not considered to be the best style of trench, and the style most in favor with the British Army at the present time is termed "the T or ┐ Trench," with supervision trench attached, generally known as a "supervision trench."

The supervision trench has two styles, namely, the "close-in" supervision trench and the "long" supervision trench. The supervision trench is considered to be the safest and best trench both from the standpoint of defence and attack. The principle of this trench, roughly, is that of a winding narrow trench with frequent T or ┐ saps extending toward the enemy.

The dimensions of this trench are as follows:

Supervision trench, three feet wide, six feet deep, from surface earth thrown evenly to both sides, well revetted.

Sap head or fire trench, three feet six inches wide at surface, three feet nine inches deep from surface to top of fire step.

Fire step, eighteen inches wide; two feet three inches from top of fire step to bottom of passageway; passageway, eighteen inches wide.

Parapet, nine inches high and six feet thick.

Parados, one foot six inches high.

Communication trench between T head and supervision trench, two feet wide at bottom, six feet deep from surface, earth evenly distributed to both sides.

Length of communication trench in the "close-in" style should be not less than nine feet. In the "long" style the length of the communication trench to sap heads should be not less than twenty-five yards, and in this style of trench the supervision trench can be made considerably wider.

Care, however, must be taken in this system of trenches to wind on easy curves the supervision trench. The distance between sap heads should be not less than nine feet. The length of

sap heads or T's should be from eight to fourteen feet.

A supervision trench is better than the standard trench for several reasons. *First*, you are able to build narrower trenches and consequently have less casualties from shell fire; *secondly*, in the event of an attack the enemy have to demolish each individual T head before gaining our line; and *third*, should the enemy get into a portion of our line, it is a simple matter for the nearest T head garrison to bomb them out. It practically makes each T head a strong point unless it has been previously demolished by artillery fire.

A T head or supervision trench has also this advantage, that the enemy when bombing down a standard trench have a clear passage, and having gained the impetus of the attack down the trench are able to carry it out a longer distance than they would in the T head, for the reason that they would have to bomb each individual T head.

Also from a defensive standpoint, in a standard trench the garrison of the trench, knowing that the enemy are successfully bombing down the trench, are liable for a short time to offer less resistance than they would were they in T

trenches, because it is impossible for the men to retreat from a T trench, and when they realize their position they are apt to fight with greater initiative.

When a T trench is used for the front line it generally happens that the standard style of trench will be used for the support trench. A T trench offers less target to enemy shell fire than the standard trench, and it has been proved by experience that, in order to demolish a section of T trenches, it is necessary for the enemy to register on each individual T. It is a question whether T trenches can be constructed as quickly as the standard trench because a very much greater amount of revetment is necessary. However, if it is possible to build this style of trench, it is very much better to do so.

Strong points. The modern system of trench fighting is coming more to the idea of having individual strong points for the front line connected either by inconspicuous communication trenches or else by tunnels, and having the support line with deep dugouts to hold the troops necessary to repel an infantry attack. However, in our warfare we find that the establishment of strong points adds greatly to the safety of any particular sector of trenches.

A strong point is simply a piece of ground which from natural or artificial means has been made difficult to destroy or observe by the enemy, and which contains a machine-gun emplacement or mechanical bomb-thrower, or else a bombing-post.

As the garrison of a strong point is compelled to remain in that point, no matter how severely an enemy attack may be pressed, it is essential that every protection which nature or artificial means can produce should be employed in order to secure the safety of the garrison of such a position. It should be sited with special reference to the tactical peculiarities of the position. If a machine-gun emplacement, it should have a commanding view of the ground which it is to protect. It should be very inconspicuous and surrounded by concealed barbed wire and obstacles. A large supply of food and water for the garrison should be kept in the strong point for emergencies; also ammunition and bombs. The garrison of a strong point should be warned that under no circumstances are they to leave it, as the safety of the regiment in that sector of the line depends upon them. Specially trained men, who are known to be brave, should be placed in these positions.

In all kinds of trenches it is important that somewhere in rear of the front line or in the front line a strong point should be located, and remembering that the garrison of such a place has no opportunity to escape should the enemy attack, every possible precaution should be taken for their safety.

If tactical considerations are taken into account, it should be impossible for the enemy to entirely penetrate a system of trenches no matter how strong the attack, and with a properly prearranged scheme of defence, should the enemy establish a footing in our lines it should be a simple matter for these strong points to hold up the enemy until our counter-attack can be delivered.

In fact a properly situated strong point should make it impossible for the enemy to hold any portion of the line which the strong point is intended to defend.

The actual construction of a strong point varies widely. It may be the cellar of a ruined farmhouse commanding a certain portion of ground, or it may be a system of trenches such as illustrated in the diagrams at the back of the book.

It is a good practice to locate bombing-posts

behind a system of front-line trenches, or else to have a bombing-ditch made as inconspicuous as possible, and dug about ten yards in rear of the front-line trench and paralleling it. The idea of this ditch is that, should the enemy succeed in gaining access to your trench, the garrison can be instructed (and practised previously) to get into the bombing-ditch as soon as they find it is impossible to resist the enemy, and as soon as the enemy have gained possession of the trench in front of the ditch the garrison can bomb them from the bombing-ditch, and will make the trench untenable for the enemy.

In a supervision trench a few dugouts should be placed in the supervision trench itself, the fewer the better, care being taken that they are made as inconspicuous as possible.

It is customary in all parts of the line except dangerous sections to have practically all the dugouts in the support line of trenches, having the dugout of the company commander in the centre of his company frontage (in the supervision trench), that of the platoon commander in the centre of his platoon frontage (in the supervision trench), the company's signaller to have a dugout next to the dugout of the company commander and closely adjoining it.

Sniper posts. Sniper posts are built under the parapet in front of a traverse. This should be a chamber not smaller than six by six feet. This chamber should be about one foot below the level of the ground, having two bullet-proof steel plates in front. These plates have two holes, one to take the telescopic rifle and the other to take a telescope. The outside of the plates is generally concealed, either by mud or imitation sandbags, and some of the new sniper plates have a metal surface similar to the appearance of ordinary mud. These plates should be eight inches apart.

Great care must be taken in locating a sniper post, and in constructing it so that it will be disguised and concealed from the enemy, as they will immediately destroy it as soon as it is discovered.

Shell slits. Shell slits are narrow, deep, straight trenches about two feet wide and eight feet deep, the sides being well shored and braced to prevent collapse. Expanded metal and shoring for revetting these trenches can be obtained "made-up" from the Engineers. As much as possible of the excavated material from a shell slit should be removed from the neighborhood of the shell slit.

Deep and shallow dugouts.
Tunnels.
Flying traverses . . . Island traverses.
Underground saps to listening-posts.
Machine-gun emplacements.
Sumps.

For all details of trench construction refer to the diagrams at the back of the book.

III

WIRE ENTANGLEMENTS AND OBSTRUCTIONS

BARBED-WIRE entanglements are placed in front of a trench to protect the garrison from a sudden rush by the enemy, and should be of such a nature that the enemy cannot crawl under, step over, or jump them.

We use for the erection of entanglements steel stakes which look like a large corkscrew. These stakes have several lapped eyes in the shank; these eyes are large enough so that the handle of an entrenching tool can be pushed through and used as a lever to screw the stake into the ground. We sometimes use pointed angle iron.

There are numerous styles of barbed wire, but the wire entanglement most commonly used at the front consists of stakes placed at an irregular distance apart (from five to eight feet), joined together in all directions by a taut wire at the bottom, a semi-loose wire from the centre or top of the stake to the bottom of the adjoining stake and a loose wire from top to top of each stake. Loose coiled wire should be laid on the ground

having the ends securely fastened. Each tie of wire to a stake should be complete so that a person cutting it will only cut down the section of wire between the two posts where he cuts. Loose barbed wire offers more resistance than taut wire and taut wire is more easily destroyed by shell fire. Good barbed-wiring may be from twelve to twenty-one feet in depth. Low barbed-wiring offers less resistance to shell fire. About three feet four inches is the average height of good barbed wire above the ground, although it may vary from two feet to four feet six inches, and in proportion to the amount of loose filler used the quality of the wiring is judged.

French concertina wire, which consists of circles of plain wire about four feet in diameter, each circle being joined to another circle at opposite points, is frequently employed at the front where a quick entanglement is required. This French concertina wire comes in lengths which when extended will cover eight yards of front. This length should be held down by four screw stakes, care being taken to securely anchor the bottom of the wire and fasten it well to the ground stakes. The interior of these circles should then be filled with loose barbed filler.

Short apron approaches of barbed wire should be laid in front of the concertina wire.

Knife rests. A knife rest is similar to a large saw-buck with about fifteen feet between crosses, the crosses being made of poles about four or five feet long of from two and one half to four inches diameter, taut barbed wire being stretched lengthwise and crossways between the crosses. The horizontal stake should extend about one foot on each end of the obstacle. The efficiency of this obstacle is increased by adding barbed wire in loose spiral coils around it.

All strong points should be carefully protected by concealed barbed-wiring. No definite plan can be laid down for this work, but the use of well-rusted barbed wire is recommended. The barbed wire which gives best results has barbs about one inch long and very close together.

It is always a good idea to have lots of barbed wire at the front line, so that it can be obtained quickly if required. Good barbed wire adds a feeling of confidence to the garrison of a trench; poor wiring lowers the morale and makes the line jumpy. Barbed wire should be placed about forty yards in front of the front-line trench, which will practially stop any attempt of the enemy to bomb your front line.

Barbed wire should also be placed between the front line and supporting trench with jack-knife rests on the rear side of any passageway in the wire. When using the jack-knife rest it is most important that the rest should be well anchored to the ground. The quickest way of doing this is to use two screw stakes, securely fastening the rest to the stakes. A good trench barricade can be made by crossing stakes saw-buck fashion and winding coils of loose wire around these stakes. These stakes should be long enough so that when rolled into the trench they will jam against the sides and are not easily removed.

Another portable obstruction, called the "aeroplane obstruction," consists of two lengths of French barbed wire rolled as circles and crossed, making a three-way St. Andrew's cross with three angle irons, and putting the crossed circles of French wire around it. This obstruction is very convenient for filling a gap in our wiring, and it can be thrown into the gap without any fastening. All saps from our front line should have a portable obstruction ready to throw into them in case of attack.

For emergency wiring any obstruction that can be devised which will impede the progress of the enemy can be used. It is the duty of every

platoon commander in the front line to inspect each night his own barbed wire, and he is responsible that it is of the proper thickness and proper quality. Coils of barbed wire should be left along the sides of the communication trenches so that, should the enemy obtain a footing in our trench, wire will be available to make obstructions for a double block.

IV

ORGANIZATION OF TRENCH SYSTEM FOR DEFENCE

THE object of a trench system is to render the front line invulnerable to assault by the enemy; to create a defensive zone of such depth as to make it impossible for the enemy to penetrate the whole of our defensive system, no matter how large the attack; to build such a system of trenches, taking advantage of the natural features of the ground and placing strong points in such positions that, although the enemy may penetrate a small portion of our line it will be an impossibility for him to penetrate the whole defensive system of any particular sector of the front; to create such a defensive system that his losses will be so great as to disorganize the attacking force, and that these strong points will hold up his attack until such time as our supports or reserves will be able to counter-attack and turn an apparent success by the enemy into a decisive defeat.

Our trenches should also be built so that they will accommodate with full protection large

numbers of our troops, so that we can with the least warning make an attack on the enemy trench. For this purpose it is also necessary that we should endeavor to site our trench as close to the enemy as possible, always remembering, however, that a little greater distance which gives protection from artillery fire will be an immense advantage. We should also carefully bear in mind, when laying out a trench or system of trenches, to consider the distribution that we can make of troops preliminary to an attack by us.

The object of all soldiers is to press forward the attack, but in some cases this object is delayed for weeks and months through considerations affecting the whole front.

In normal warfare the improvement of trenches and economical distribution of the garrison of the front line must be considered of great importance in order to reduce the casualties from disease and battle. Sanitary considerations are of vital importance.

You must always remember that certain portions of our line are of no value to the enemy. In fact, should he obtain them they would be a probable menace to him, and, therefore, we would garrison such a portion very lightly, holding it probably with only a few machine

gunners, in battle machine-gun emplacements, and with a few snipers in regular snipers' posts. On the contrary, other portions of our line are of greatest importance, both to us and to the enemy, and such a portion must be built and garrisoned very strongly, well protected by machine guns and snipers' posts in the front line, and by machine guns in échelon formation in rear.

Minor offensive operations by us will compel the enemy to garrison his front line more strongly than we do, thus increasing his rate of wastage; also minor operations have the effect of reducing the morale of the enemy.

The front line is to be held lightly when the support line is close and connected to the front line by numerous communication trenches.

The reason we garrison our front line lightly is to avoid loss from snipers, shell fire, and disease, and in order to give our men a better rest from the nervous tension of those who are closer to the enemy. It must be remembered, however, that a lightly held front line makes the troops in that sector jumpy. Therefore, it is advisable in most sectors to reinforce the front line at night in order that a feeling of confidence may be inspired in the line and also in order to repulse any enemy raids.

It is customary in a quiet sector of the line to place two or three companies of a battalion in the front line, each company finding its own supports, the balance of the battalion being placed in reserve. However, no set rule can be laid down for the disposition of a battalion because each sector of the line varies, and in some places it may be found necessary to place one company in the front line, two companies in support, and one company in reserve; or two companies in the front line, one company in support, and one in reserve; or three companies in the front line, one in support, and the reserves to be found by another regiment.

The practice, however, of making one regiment responsible for a certain sector of the line, no matter how small, is to be commended, because it adds to them a sense of responsibility for the safety of that portion of the line, and it should be impressed upon all ranks that under no circumstances must a portion of the line be evacuated unless positive orders from a responsible recognized source are received so to do.

Telephone communication between headquarters of companies and battalion headquarters should be established immediately, and should be of such a nature as to reduce to a

minimum the chance of interruption by shell fire. Each company of a battalion should be self-contained; that is, each company should have its own machine gunners, its own bombers, its own gas team, its own snipers, its own signallers, and its own sanitary section.

Machine guns. Machine guns mean economy of men in the line. They add confidence to the men in the front line and assist greatly in repelling attacks, and are of great assistance in punishing enemy working parties and patrols.

It is natural for one to wish to place all his machine guns in the firing line. This, however, is bad policy and should be avoided if possible; and should all machine guns of a battalion be placed in the front line, before doing so, arrangements must be made for extra machine guns and crews from other units to occupy the strong points in the support and reserve lines and intermediate places.

You must remember that in an enemy bombardment preliminary to an assault, the chances are great that all machine guns and their crews in our front line would be destroyed. Consequently, while placing as many guns as necessary in the firing line, the rest should be placed in rear, either in support or reserve trenches, or inter-

mediate strong points, in order to stop any attack which the enemy might make after destroying our firing line. These machine guns are usually placed in rear in échelon formation, always remembering that more effective results can be obtained by enfilading than frontal fire.

Machine guns should be placed in bomb-proof machine-gun emplacements, using preferably the mudded, steel, or imitation sandbag front, and particular care should be taken in constructing the machine-gun emplacement that it is concealed as much as possible, especially that no machine-gun emplacement should be built which cannot be completed during the night, or, if uncompleted, which cannot be effectively disguised so that the enemy will not notice that construction is taking place at that point. It sometimes occurs that the enemy learn the location of a machine-gun emplacement and do not destroy it until just before their attack. Consequently the necessity of using the greatest precaution from observation when constructing.

Machine-gun emplacements should be made in duplicate close together, so that should one emplacement be destroyed another one is immediately available for use. If at all possible machine-gun emplacements should be protected by sur-

rounding them with invisible barbed wire. Also plenty of good food and water should be kept in these machine-gun emplacements, the water being changed daily.

It must be impressed upon all machine gunners that they are supposed to stick at their gun as long as the gun is serviceable, no matter whether the enemy get into their trench or not.

Lewis automatic rifles. Lewis automatic rifles are used in garrison duty for the purpose of firing over the parapet at night or from temporary emplacements. In a danger sector it has been customary to get the automatic rifles of the support and the reserve lines for use in the firing line. This practice, however, is dangerous, and should such an arrangement be made, the brigade machine guns should be called upon to support the rear. It must be remembered that it is most important that these Lewis gunners should be protected during the bombardment, because the chances are that the garrison heavy machine guns will be destroyed, and the duty of repelling the attack will fall to a large extent upon the Lewis guns.

Enemy attack. An enemy attack should be stopped at its very beginning, because it frequently happens that the enemy send out a

small number of troops in the first wave, and, depending upon the success of those troops, follow up the attack with larger numbers. Therefore, you should by a concentration of machine-gun and rifle fire stop the enemy as soon as they leave their trenches, always remembering to send in the artillery S.O.S., either by signal or telephone message, the instant that the enemy are seen leaving their trenches.

The S.O.S. will obtain for you a barrage of shell fire having a burst point fifty yards in the front of your trench and thirty feet in the air. This barrage is frequently called a "curtain" fire.

Should the enemy gain a footing in your trenches it is the duty of the nearest troops to immediately counter-attack, always remembering that the more you delay a counter-attack the more casualties you will have, and the stronger the enemy will have entrenched themselves. It has frequently been found that, even though a much smaller body of troops than those of the enemy delivered the counter-attack, the counter-attack has been successful through the unprotected state of the enemy, and also on account of his exhaustion of both man power, ammunition, and bombs.

Nearly all well-organized trench systems have bombing-pits or ditches in the rear of their front line; also strong points in rear, which are to be held until the last.

During the preliminary bombardment by the enemy it is customary to withdraw your troops from your front line to the shelter of shell slits or deep dugouts, leaving only your battle machine-gun emplacement crews and a very few sentries in the firing line.

By keeping careful observation from your support trench on the enemy front line and your own front line you will be able to observe the moment that the shelling ceases and immediately rush your troops back to the front line again. In this way you will be able to protect your men from casualties and also stop the enemy rush.

Every battalion, every company, and every platoon commander should work out a defence scheme for the part of the line for which he is responsible, and make sure that all concerned are thoroughly familiar with this scheme, so that should the enemy gain a footing in your trench a systematic endeavor will immediately be made to displace him.

It cannot be too strongly impressed upon all ranks that it is the endeavor and must be the

object of every one that, as soon as the enemy have gained a footing in a trench, an immediate counter-attack must be made by the nearest troops, even though they are inferior in numbers to those of the enemy. All defence schemes should be tactically correct and should always include the counter-attack.

In the British system of fighting it is customary to consider in almost every case that the firing line is the main line of defence, and should the enemy obtain a footing in our firing line, by all means drive him out.

Stubborn defence against the enemy, should he be bombing down your trench, the immediate placing of the double block, blowing up the intervening traverses, and filling up this space with loose barbed wire, the use of an automatic rifle and bombers at your side of the block, and careful observation of the land around the trench from the direction in which the enemy is approaching, will almost always hold up an attack. Never forget that you are supported by the most excellent artillery, and notifying the artillery immediately, giving the exact locations of the sections of trench which the enemy are in, and stating just what coöperation you wish of them, will greatly assist in clearing the trench.

As soon as an attack occurs, the supports should immediately reinforce the front line without awaiting orders, and should the trench be taken the supports should at once deliver the counter-attack and continue the counter-attack, which will almost always prove successful. Should our front line be blown up by a mine, the supports should immediately rush forward and occupy the enemy's side of the crater. Should the supports fail or be wiped out when delivering the counter-attack, it is the duty of the reserves to deliver the counter-attack, or should the reserves be too small they must immediately prepare to hold the line that they are then holding, at all costs, until sufficient force can be assembled to clear the enemy out of our trenches. This force would generally be the brigade reserve, but in all cases must consist of the nearest troops who are not actually engaged on garrison duty in the line.

Coöperation with the artillery. It has been found that infantry officers are not sufficiently familiar with the work of our artillery, and every opportunity should be taken for them to become familiar with the methods of observing for the artillery. In this connection the most vital point from an infantry standpoint is the artillery protective bar-

rage. The method of obtaining an artillery barrage at night is by the S.O.S. rocket. These rockets, which are roughly about one and three quarters inches diameter and eighteen inches long, with wooden tail-piece five feet six inches long, are fired from a section of gas-pipe, simply placing the wooden tail inside the gas-pipe and lighting the fuse at the bottom of the rocket. The rocket on reaching its final height bursts in usually three colors, say red, blue, red. Every time that the S.O.S. signal is used the combination of colors composing it is changed.

The artillery action upon seeing such a rocket burst is as follows:

The artillery have an imaginary front line located fifty yards in front of the infantry front-line trench, and thirty feet in the air, and when the battery finishes its daily work the guns are trained upon its imaginary line, each battery being given a definite front line of its own. This does not mean that only one battery would have the same front line, because it frequently and generally happens that several batteries have the same or overlapping front line. The batteries in rear of the line are arranged usually according to the protection or concealment offered, from half to three quarters of a mile or even greater distance behind our front-line trench.

Generally the 4-inch, 5-inch, and 6-inch howitzers occupy the first artillery lines, and then the flat trajectory guns have a line in rear of the howitzer lines, and then in rear again we find the larger howitzers 7.2-inch and 9.2-inch and then 12-inch howitzers, 12-inch naval guns, and even 15-inch howitzers and larger guns. All these different sizes are arranged in lines according to their range in rear of our front line, care being taken that the frontage on the imaginary line in front of our front-line trench is carefully overlapped by all these batteries.

Fifty to one hundred yards in front of each battery, no matter how far back it is located, are two luminous posts on the right and left flank of No. 1 and No. 4 guns. The guns as soon as they come out of action from their daily work are loaded and trained upon the imaginary firing line which has been assigned to that battery. A sentry paces constantly between No. 1 and No. 4 guns, always looking to the imaginary firing line to the front between the two luminous posts. Should the S.O.S. rocket come up on the battery front, the sentry immediately pulls the trigger of No. 1 gun. This awakens the trigger man of No. 2 gun, and Nos. 2, 3, and 4 fire their guns, and by that time the gun crew of No. 1 gun have reloaded.

STORY

At Saint-Eloi, in 1916, the Germans were attacking our position, and we sent up an S.O.S. rocket, and within ten seconds we had fourteen hundred eighteen-pounder field guns putting up a barrage fifty yards in front of our trench with a burst point thirty feet in the air. This fire was concentrated on a frontage of one thousand yards, being five hundred yards either side of the point where the rocket was sent up. When you remember that the lateral burst of a shell is twenty-five yards either side of the burst point and the forward burst one hundred and fifty yards, and also the fact that these eighteen-pounder guns were fired at the rate of eighteen shells per minute, you will gain some idea of the tremendous screen of fire which our artillery places in front of us. Beside these eighteen-pounder guns we had several hundred heavier guns firing upon the enemy front line, supports, reserve line, and communication trenches, also his lines of communication in rear.

Unfortunately the enemy put up a counter-barrage which destroyed our communication with our artillery, and although our barrage had destroyed all the attacking enemy infantry, we

were unable to shut off our barrage for nearly forty minutes, and finally we had to send back messengers to headquarters to have the barrage discontinued.[1]

Infantry officers must be very careful not to use the S.O.S. signal frivolously, and they should always be sure that an attack is intended by the enemy before using the S.O.S. On the other hand, they should never hesitate, should they have the slightest idea that the enemy are making an attack, to use the S.O.S., as it is better to waste ammunition than to lose a trench.

If an attack by a very small number of the enemy is made, you can easily put it down with machine guns and rifle fire, but all officers should remember that they are responsible for the sector of trench which they are defending, and under no circumstances must they neglect to use every available means of holding that trench until the last moment.

[1] A battery must not discontinue firing in response to an S.O.S. signal until they are definitely assured that the necessity which caused the signal to be used has ceased to be.

V

ATTACK IN TRENCH WARFARE

THE success of an attack on the enemy trench system depends entirely on the preparation for the attack, the training of the troops participating, and the morale or discipline of those troops.

Confusion is apt to occur in almost every attack and it is largely through this confusion that enemy counter-attacks may prove successful. Unless this confusion is prevented or minimized, serious results are bound to occur. Plenty of time is available for careful preparation and training of the troops participating. An attack may be said to commence weeks before the actual assault. Therefore the fullest advantage should be taken of this time in order that the preparation may be worked out to the minutest detail and all troops thoroughly trained in the particular part which they will have to do.

Preparation. The most careful reconnaissance must be made of the enemy trenches, full advantage being taken of all maps, sketches, or photographs of the sector. Aeroplane photographs should be taken daily and carefully com-

pared, so that any improvements made in the enemy line will be immediately noted.

The ascendency should be established of "No Man's Land," and a constant system of patrols should be sent nightly to thoroughly reconnoitre the intervening ground between our trench and the enemy.

Every effort should be made to locate enemy machine-gun emplacements and strong points, and infantry officers can be of great assistance to the artillery by helping to observe the effects of our preliminary bombardment.

The whole of the enemy's system of trenches, over which the attack is to be made, should be made thoroughly familiar by maps and blackboard drawings to every man taking part.

Plan of attack. First, the distribution of the attacking infantry; that is, the number of lines or waves required for the attack, and the points opposite which the assaulting waves must be strongest in order to deal with enemy strong points. Each party should be detailed for a special task and every man in that party should know what that task is; that is, parties should be detailed for clearing the trench, commonly called "moppers-up," other parties should be detailed to bring out tools, sandbags, ammunition,

bombs, Stokes shells. Parties should be detailed to dig communication trenches between the enemy line and our own front line, taking advantage of any enemy saps running out towards our lines and of our saps, so that as little delay as possible will be necessary. *The use of machine guns:* detailing a certain number to go forward with the attacking infantry. *Employment of bombs.*

Arrangements should be made with our units on both flanks of the attacking party to keep down enfiladed fire, and to generally assist as far as possible. Special arrangements should be made for maintaining communication. If possible, should the attack not be on a very large scale, a facsimile system of trenches to those which are to be attacked should be built fifteen or twenty miles back of the line, carefully guarded, and allowing no one whatever to enter who is not detailed for that purpose, and the troops who are to make the attack should be practised daily and also nightly, both with officers and N.C.O.'s and also without officers or N.C.O.'s, until each man is thoroughly perfect in his appointed task.

Each of the men should be asked for suggestions of improvements or better ways of carrying

out the attack, and very careful consideration should be paid to their suggestions.

Before taking part in an attack troops need special physical training, because ordinary trench duty has the effect of softening men. Therefore, they should have "setting-up" exercises and considerable route marching. If our trench is more than one hundred yards away from the enemy, it may be necessary to build a new trench so that our men will be able to start the attack from a distance of not more than one hundred yards, preferably less.

The construction of this trench must take place some considerable time before the attack, say several weeks, and it will also be necessary that assembly trenches should be dug in the rear of our front line to hold the attacking troops. This must be done a long time before the attack is to take place, and it should be the aim of all battalion commanders, when a battalion is in ordinary garrison duty, to see that his trenches are so arranged that no special trenches will be necessary should an offensive be planned from his sector of the line. Plenty of communication trenches should connect our front line with the rear.

Saps should be dug forward from our front line

so that means of communication can be quickly established and the German front line consolidated into our own line. Stores of S.A.A., bombs, demolition material, tools, sandbags, water, and food should be placed in our front line ready to move forward as soon as the trench is captured.

Preliminary bombardment. The preliminary bombardment will probably take a long time. In one case it covered twenty days. This bombardment should destroy absolutely the enemy trenches, dugouts, machine-gun emplacements, and strong points, as well as completely destroying his barbed wire.

Our machine gunners in the front line should be particularly active at night during this preliminary bombardment, so as to give the enemy no opportunity of repairing any of the damage which our shells have done. Infantry officers by endeavoring to locate machine-gun emplacements and strong points can greatly assist our artillery in the preliminary bombardment; also by observing and reporting the effect of the fire on the trench opposite.

During this preliminary bombardment the Stokes guns and trench mortars can be of great assistance. The moment for the assault having

arrived, known at the front as "zero time," or so many minutes after "zero time," the bombardment lifts and a moving barrage or curtain fire is put up fifty yards in front of our front-line trench and burst point thirty feet in the air. This barrage moves forward toward the German trenches at the rate of eighty paces to the minute, and our men advance in the waves which they have been previously formed in, each one heading for the definite objective and definite task which it has to do and at the time appointed for it. These waves usually move forward with fifty yards' distance between them. The pace must be normal and on no account must the men be allowed to indulge in a wild rush, because they will simply be rushing into our own barrage.

The reason that it is necessary to send over a barrage ahead of our attacking line is that the Germans have a custom of getting out in shell holes in front of their trench during the bombardment and are then able to delay our attack with machine guns. However, a moving barrage as a rule proves very effective and destroys all opposition.

Generally speaking, the attacking party would be divided as follows:

(1) Troops to press forward the assault to the objective.

(2) Troops detailed to follow up the assaulting party and mop up the trenches captured.

(3) Troops detailed to consolidate the trenches as they are captured.

Special arrangements must also be made to defend the flanks of the newly captured position.

The duty of the artillery during the attack would be to keep down hostile artillery fire by counter-battery fire, to prevent the enemy from bringing up supports or reserves, and to shell all lines of communication in rear of him, to give continuous support to the infantry during the attack.

Contact patrol. Before the attack takes place, troops should carefully practise coöperation with the flying corps in contact patrol work. The means by which this is done are as follows:

An aeroplane specially detailed for the purpose (having a special identification mark) and in direct communication with our supporting artillery flies low over the attacking party, and at frequent intervals toots the klaxon horn asking for contact.

It is the duty of the officer who is nearest to

the enemy on each flank of the attacking party to light three colored ground flares and place in the bottom of the trench, and at intervals of twenty-five yards between these flank flares other flares should be lighted in groups of three. The flying corps officer is immediately able to locate just how far our troops have been able to advance, and so informs the artillery, who at once come to the assistance of our troops by destroying the enemy in front of our foremost troops.

This contact patrol system worked splendidly at the Somme in 1916, and it was found in every case where our troops were temporarily held up, the prompt assistance and accurate shooting by our artillery made the advance easy.

Machine guns. Employment of machine guns in attack is a separate lecture. It should be impressed upon all ranks while an attack is in progress that under no circumstances must any man of the assaulting party stop to tend the wounded. The duty of all is to fight and to carry out their appointed tasks, and the duty of the wounded is to place their bombs and ammunition in a conspicuous place near them and tie up their own wounds.

Prisoners. It will be found impossible for the assaulting party to take prisoners, and you must

remember that every prisoner taken by the assaulting party must be carefully guarded. Therefore, you would so weaken your assaulting party that its object would be defeated. The "mopping-up" party, however, may according to circumstances take the prisoners.

Immediately the objective is gained, the greatest haste should be made to consolidate with our other trenches, destroying all communication trenches leading from the Germans to the captured trench and hastily reversing the parapet and fire step.

It may be necessary, in order to give our troops the time to do this, for our artillery to place a protective barrage in front of the captured position, but as soon as you reach the objective one must immediately expect and prepare for a counter-attack, and according to the extent of your preparation your success in beating it off depends.

VI

TRENCH RAIDS

TRENCH raids would probably come under the heading of trench annoyance and were first instituted by the Canadians, who achieved so much success in this form of harassing the enemy that the operation orders used by them were copied by all the Allies.

The purpose of a trench raid is:

(1) To find out what unit of the enemy is in that sector of the line. The reason we desire this information is that we have accurate knowledge of the units which form the German shock or attack troops, a special enemy organization used in attack work. Consequently, when we find one of the regiments composing this organization opposite a portion of our trenches, we know that we may expect an attack.

(2) Trench raids are used to cause the enemy casualties, to destroy his trench fortifications, and to decrease his morale.

(3) To make the enemy garrison his front line heavily, thus enabling our artillery and trench mortar batteries to cause him a great many casualties.

Preparation. As soon as it has been decided to make a trench raid on any particular part of the line, the most complete information should be obtained concerning this portion of the enemy trench.

Daily aeroplane photographs should be taken and compared with the preceding day's photographs so that any improvements or alterations of the enemy trench will be at once noted. A most careful study should be made of all available maps of the trench concerned.

Supremacy should be established in "No Man's Land" by constant fighting patrols at night. The battalion bombing and machine-gun officers should make a most careful reconnaissance of "No Man's Land" opposite this trench, being careful to observe all obstructions, ditches, and barbed wire.

It should be decided whether artillery preparation will be necessary, in this connection remembering that artillery preparation will eliminate the advantage of surprise. A definite objective should be stated and this objective should be

known to every man taking part in the raid. Also each man must have a definite task allotted to him and must know what this task is.

In choosing the raiding party a preference should be given to brave men of good nerve who are good bombers and who are not drunkards. Having chosen the raiding party, they should be taken fifteen or twenty miles in rear of the line and there made to construct an exact duplicate of the enemy trench which they are to raid. They should practise the raid both during the day and night for several weeks, if possible, both with and without officers and N.C.O.'s. Especially should the principle of juniors taking command be taught, even down to the private soldiers taking command, so that no matter how many casualties occur there will always be some one to promptly jump in and take command of the raid. Each man should be asked for suggestions and his suggestions carefully considered. The raiding party should practise building double blocks. (A double block is a piece of trench with the intervening traverses removed by explosion, both ends being blocked by an obstruction and barbed wire laid between the two obstructions. The usual length of a double block is forty yards, but they may be made considerably less. The object is to place

the intervening dead ground between you and the enemy so that he cannot bomb you or drive you back along the trench.)

When it is thought that the raiding party thoroughly understand their task and have sufficient training to successfully carry out the raid, provision will be made on the night preceding the raid for a supply of spare bombs, sandbags, and tools to be taken out and laid in shell holes. This material should be carefully covered, and yet its hiding-place should be thoroughly familiar to the carrying party which will be attached to the raid.

Several bombing squads, consisting of the following formation, will be organized and detailed to bomb the front line:

1. No. 1 bayonet man.
2. No. 2 bayonet man.
3. No. 1 bomb-thrower.
4. No. 1 bomb-carrier.
5. N.C.O. in charge.
6. No. 2 bomb-thrower.
7. No. 2 bomb-carrier.
8. No. 3 bomb-carrier.
9. Spare man.
10. One rifle grenade man, or sniper.
11. One rifle grenade man, or sniper.

Similar bombing squads should be detailed to go down the communication trenches with instructions to go fifty yards beyond their objective and there establish the far end of the double block. They then retire, demolishing the trench, and filling the interval with loose barbed wire, and from thirty to forty yards behind the farther block establish the second block, which should be at their objective. The same applies to the right and left flank bombing squads. They will proceed fifty yards to right or left of their objective and there establish a double block. On our side of the double block it will be found advantageous to employ an automatic rifle in order to keep the Germans from going overland in their counter-attack. Demolition parties for the purpose of assisting in constructing these double blocks should be specially detailed and trained in the quick placing and use of gun cotton.

Arrangements should be made with the units on each flank to keep up a heavy machine-gun and rifle fire on the flanks of the raid. Also the trench mortar and Stokes batteries should be called upon to assist in this work in order to keep the enemy on the flanks from making a counter-attack on the raiding party.

Special men should be detailed as extra car-

riers, whose duty it will be to carry up the spare bombs and material which were left in the shell holes the previous night. These men can also be detailed to assist in mopping-up the trench or guarding prisoners.

An advance party should precede the raiding party to cut a way through both our own and the German line and to kill any listening-post of the enemy which they may be able to discover. If possible these men should be killed with the bayonet; if not a bomb may be used; but if a bomb is used in that sector it is liable to make the enemy jumpy and defeat the object of the raiders. Should the raiders be intended to remain in the enemy trenches for any length of time, it will be found very valuable if you are able to lay telephone communication with your own trench.

On arrival in the enemy trench all that are met must be immediately killed and deep dug-outs bombed, using either several Mills bombs or else a Stokes shell. It is generally desirable to obtain two or three prisoners, so that they may be taken back and information obtained from them. If you are unable to do this you can secure numerals and badges of shoulder straps which will serve for identification purposes. A

demolition party will destroy all machine-gun emplacements and all trench fortifications which they may find.

Special observation should be made of any improvements which the Germans have under way, and if possible their exact location identified, so that later on our artillery may be turned upon these points when the enemy have again occupied the trench.

Some distinctive signal should be thoroughly understood by all as the signal for retirement, and it may be advisable to have our artillery put up a protective barrage around the raided area to assist our men in retiring. The automatic rifle men will be the last to retire and will cover the retreat of the others. All our wounded men must be brought back with the raiders.

The men before going on such a raid should blacken their faces and remove all distinctive badges. Several stretcher-bearers should be detailed to accompany the party.

All documents, both written and printed, which are found in the enemy trenches, including personal letters, should be carefully brought back and immediately sent to brigade headquarters. Prisoners should also be sent at once to battalion headquarters, who in turn will forward them to divisional headquarters.

The success of a raid depends upon the bravery of those participating, upon the initiative of their leaders, the thoroughness and training of their preparation, and the care used in approaching the enemy trench. Once the raiders arrive in the enemy trench, the attack must be pushed forward with all possible haste to the objective.

VII

POISON GAS AND LIQUID FIRE

THE use of poisonous gas was first adopted by the Germans, and it is now an acknowledged weapon of warfare.

At the Battle of Langemarck in April, 1915, the Germans first used gas on a large scale against French, British, and Canadian troops, and on account of the surprise and lack of knowledge of protective measures, we suffered a great many casualties. The French were compelled to retire a considerable distance and history gives the Canadians credit for holding and saving the line. The Canadians tore pieces off their clothing, used old socks filled with earth, or even handkerchiefs filled with earth, and dampened them with water or urine and used them as a respirator, and to some extent were able to save their lives.

In this battle the Canadians were practically unsupported by artillery, and regiments which went into the line with practically full strength, at roll call at the end of the day were found to have sixty to ninety men still in the line.

The bravery of these men was wonderful, and when you consider that the vilest form of warfare ever invented by man was used against them, and also that they had no knowledge of defensive measures to take, it adds the more to their credit.

It must be absolutely insisted upon that every person in the Army Zone must be thoroughly familiar with and carry gas helmets or box respirators, the use of which will be described later.

The methods employed in a gas attack are two, either by cloud or drift method or by shells or emanation method. In the first method gas is compressed into cylinders, four in a group, one cylinder being required for each yard of frontage to be gassed. The cylinders are very similar to those used in a soda fountain. These cylinders are buried under the fire step and piped together in groups of four, the pipe then leading to the surface of the ground and the pipe underneath the parapet extending from six to fifteen feet in front of the trench.

A favorable wind must prevail for a gas attack; that is, the direction of the wind must be practically from one trench to the other trench. The gas is forced through the tubes in the direction of the enemy, by means of liquefied gas stored in the cylinder under pressure.

The following conditions are required:

Wind from five to nine miles per hour, although gas attacks have been known to occur with a wind of seventeen and one half miles per hour, but the wind should be not less than five miles per hour.

Gas cannot be discharged during a rain-storm, as water has the effect of absorbing gas at the rate of one pound of water to twelve pounds of gas.

Surprise is essential, as otherwise the enemy will have an opportunity of taking protective measures.

If the wind is too strong, the gas will go too quickly over the enemy trench and consequently will be less effective. If the wind is too light, the gas is liable to come back into our own trench. It is impossible to set an hour for a gas attack. Everything depends upon the wind.

Arsenic and phosphorus compounds are sometimes used and their presence can be detected by a smell of garlic. Chloride of lime scattered freely in a trench will disperse this gas.

Chlorine gas, mixture of chlorine and bromine, 90% and 10%. The Germans also use a mixture of **Chlorine and Phosgene** ($COCO_2$); this liquefies at 8° Centigrade, so can only be used in

warm weather. It is a yellowish liquid which gives off a colorless gas having no immediate effect, but kills in twelve hours.

Phosgene gas, sulphuretted hydrogen, and other gases are used.

Shell and bomb method. Shells and bombs containing liquid gas or substances which give off poisonous fumes are frequently used. **Lachrymatory shells** causing an irritation of the mucous membrane of the nose, throat, and mouth, and the eyes, are frequently used. No injurious effects of a permanent nature are caused by these, although the temporary effect is that a man's eyes are very sore and possibly he may be sick to his stomach. However, the helmet is absolute protection against this form of gas.

Lachrymatory shells contain bromacetone or chloracetone. Bombs weighing from twelve ounces to a pound, and similar in appearance to a jam-tin bomb, are sometimes used. They are fired in the same way as the ordinary jam-tin bomb, and when used, large numbers should be concentrated at different points so that the greatest effect will be secured.

Defence. The direction of the wind must always be noted, and if it is favorable for a gas attack by the enemy a "Gas Alert" must be

ordered. This means that every one places his helmet or box respirator in the emergency position as follows:

(1) Put the helmet on the head loosely.

(2) Lay the wallet on the chest against the shirt.

(3) Pin with two safety pins the front bottom of the helmet where it joins the wallet itself to the skirt, inserting pins on a level with the top of the pockets so that they will hold the helmet tight.

(4) Remove the helmet from the head and fold inwards; that is, holding it up, fold it away from you. Roll it up and place against the cover of the wallet. Turn up the wallet over the helmet; leave the top of the tunic unbuttoned.

Gas helmets. Each man is equipped with two helmets made of a double thickness of wool or flannelette saturated with chemicals which absorb gas (hexamine). The helmet most commonly in use at the front is known as the "P. H. G." and is complete protection against all kinds of gas which have yet been used by the Germans. It has two glass eye-pieces screwed into the flannel and a tube valve through which to exhale the breath.

Inspection of helmets. Look for holes, either large or small; even needle holes should be entirely filled by thread or fabric. Make sure that the eye-pieces are not cross-threaded. See that the glasses are firmly seated on the rubber washers and not cracked or broken. The valve must work freely one way, namely, outward. Emphasize the proper method of folding the helmet and putting it on. Warn men to grasp the loose skirt tightly around the throat.

Practise gas helmet drill daily when in billets, using condemned helmets for this purpose.

If, when wearing a helmet, the eye-glasses become clouded, rub the glass against the forehead which will clear the dimness. After a gas attack do not remove the helmet or respirator except on the command of an officer *who has his own helmet off*. Even then each man should carefully sniff the air for himself before removing his helmet.

Box respirators. All units are now being supplied with box respirators, but they continue to carry the helmet as reserve protection. The new small box respirator, carried in a small haversack, protects against all poisonous gases except *carbon monoxide*, which is very rarely used. In the box are layers of different substances to neutralize different poisonous gases. **Alkaline** sub-

stance neutralizes all acids, the asphyxiants. **Reducing agents** neutralize lachrymatory gases. **Oxidizing agents** purify the air. The mask, which is held on a band around the head, contains a mouthpiece connected with the box by a reinforced rubber tube, and a nose clip which keeps the nose closed. The mask is absolutely impervious to gas and air. It fits tightly around the face and chin. It is made in three sizes. This respirator does not deteriorate and is more quickly put on than the helmet.

Vermorel sprayers. Vermorel sprayers are trench equipment in every company front, and should be carefully inspected when taking over the trench to see that they have not been damaged and that they are properly charged, and also that there are jars of extra solution.

These sprayers consist generally of a small tank, carried either haversack fashion or as a knapsack on the back with a pump arrangement and hose and nozzle. They are charged with a solution of *sodium thiosulphate*, more commonly known as "Hypo," six pounds being dissolved to a bucket of water and a handful of ordinary salt added.

If the vermorel sprayer is out of condition, any means of spraying this solution throughout the

trench will attain results, but the finer the spray the better.

Each company in the front line should organize a gas-clearing squad, who will carefully examine the gas preventive measures, and whose duty it will be as soon as a gas attack is finished to clear out the trench, using sprayers and fans and lighting fires.

The Germans, during our gas attacks on them, are accustomed to build fires of straw on their parapet, but we have found by experiments that this method is practically useless in dispersing a gas cloud.

Detection of a gas attack. *Chlorine phosgene* is colorless, but can be detected by a hissing sound caused by the discharge of the gas through the pipes. Chlorine gas may be yellow or brown, and is frequently sent over in conjunction with a barrage of smoke bombs over a large frontage so as to disguise the gas. Any cloud of any nature appearing on the ground near the enemy trenches should be the signal for an immediate gas alarm.

Chlorine gas smells something like chloride of lime. Phosgene gas smells like violets. The success of a gas attack or defence is in the quickness of action taken. Immediately that the presence of gas is suspected, the gas alarm should be given

by sounding klaxon horns or beating gongs, and every man should immediately put on his helmet or box respirator.

The artillery S.O.S. signal should be sent up immediately in order that they will put up a barrage fifty yards in front of your trench. The idea is that our shells will not only prevent an enemy attack, which is always to be expected with a gas attack, but also that the exploding shells will break up the gas cloud. As soon as the gas cloud obscures the enemy trench from view, order your men to stand on the fire step and deliver controlled rapid fire in the direction of the enemy trench, gradually directing this controlled fire to the bottom of your own barbed wire.

Order all machine guns, including battle emplacement machine guns, to open rapid bursts of fire at the bottom of your own barbed wire.

While rifles and machine guns are not in action during a gas attack, have the bolts and moving mechanism worked rapidly back and forth, as the gas has the effect of thickening the oil and clogging the action.

The Germans have the habit of sending over gas attacks in three waves. As soon as a gas attack has gone over your trench, take prompt

measures to expel the gas from your trench, but do not allow your men to take off their helmets until you are thoroughly satisfied that the trench is clear of gas. After the trench has been cleared, the men should put their helmets in the emergency position.

A gas attack has been known to kill men at a distance of nine miles in rear of the line. For that reason it is necessary that every man at the front at all times should carry his two gas helmets with him ready for immediate use.

While frivolous gas alarms are to be discouraged, yet the greatest care should be taken should a gas attack be likely, and if at all in doubt it is better to give the gas alarm.

The Germans sometimes place large canisters of liquid gas in "No Man's Land," and await a favorable wind and then puncture these cylinders by rifle bullets. They also use gas bombs thrown from trench mortars.

The shell or bomb method of carrying gas is advantageous because the gas arrives at the enemy trench without giving him any notice and consequently is liable to find him unprepared. On the other hand, it has the disadvantage that only small quantities can be used.

First aid. A man who has been gassed should

be treated as in a case of drowning. Gas is very much heavier than air and must be expelled from the lungs the same way as water would be. All persons must be warned not to attempt to run away from a gas attack. The very best chance of their safety is in staying quietly in the trench and carrying out the duty ordered of them. Both the helmets and the box respirators afford absolute protection, provided they are undamaged, and men must be warned to thoroughly inspect their helmets twice daily to see that they are in good condition, and under no circumstances to attempt to change their helmet during a gas attack.

It frequently happens that a man feels a slight irritation on his forehead and in the nose and throat while wearing his helmet, and he imagines that he is being gassed. Such is not the case; this irritation is caused by the chemicals in the helmet, and we have suffered heavy casualties by men attempting to change their helmets during a gas attack when in reality their helmets were perfectly good.

The use of strychnine (one fortieth grain) may be found beneficial where a weak heart action exists. In cases of intense suffering, morphine in small quantities may be administered. Vomiting has been found beneficial in expelling gas.

Liquid fire. Liquid fire was first used by the Germans, and it is largely a morale-effect weapon. The methods used to produce liquid fire differ. They consist generally of a tank containing highly inflammable liquid, petrol, or coal oil. This liquid is forced out under pressure of compressed nitrogen gas (ninety pounds pressure) through a long pipe nozzle and is ignited by a safety lighter on reaching the air, producing large volumes of smoke and flame, and has a terrifying effect on troops who do not understand the method of combating it. However, the flame which is thus produced heats the surrounding air, and this heated air tends to lift the flame rather than to allow it to be directed in the same manner that you would direct a stream of water. Consequently, should a liquid fire attack come down your trench, all that is necessary is for you not to expose yourself above the height of the trench, and a few well-directed Mills bombs will effectively dispose of the attacking party.

If caught in the open by a liquid fire attack, bayonet men should charge madly at the source of the fire, and the chances are about ten to one that they will not be seriously injured and they will be able to stab the nozzle man. The range of liquid fire is about twenty-five yards, and it can

be used with considerable effect in protecting a trench from a frontal attack. Its value, however, as a trench weapon is decidedly limited.

The Allies at the present time have a very much more effective liquid fire apparatus than that of the enemy.

VIII

TRENCH ROUTINE

STANDING ORDERS FOR THE TRENCHES

1. RELIEFS.

(1) When a battalion is taking over a new line of trenches, the company commanders will invariably visit the trenches on the day previous to that on which the relief takes place. They will gain as much information as possible from the company commanders they are relieving.

(2) An officer of each company should proceed in advance to the trenches on the day of the relief, to take over, during daylight, all trench stores, ammunition, etc. Mutual receipts for these will be signed.

(3) Machine gunners, bombers, snipers, and signallers will not be relieved on the same day as are companies. They should proceed to the trenches twenty-four hours before their battalions, and take over their posts during daylight.

(4) The strictest march discipline will be maintained by all parties proceeding to, or from, the trenches. An officer will march in rear of each company to insure that it is properly closed up.

(5) Relief will be carried out as quietly as possible. No smoking or lights will be allowed after reaching a point to be decided on by battalion commanders.

(6) Guides at the rate of one per platoon, machine gun, or bombing-post will invariably be arranged for by brigade headquarters when battalions proceed to the trenches. Likewise, when battalions are being relieved, a similar number of guides will be detailed by them to meet relieving units.

(7) On taking over a line of trenches a company commander will at once get in touch with the companies on his right and left; he will ascertain the position of the nearest supporting troops, of the reserve ammunition, of any machine guns or bombing-posts, and of his battalion headquarters; he will ascertain the best and quickest means of obtaining artillery support, and he will have tested all wires, including the artillery wire, if there is one. When his platoons have taken over, and he is satisfied that all is correct, he will inform his commanding officer by telephone that the relief of his company is complete.

(8) The actual relief of trenches should be carried out in the following manner:

The platoon being relieved gets on the firing step.

The relieving platoon files in behind and halts. On the word

"Pass," which will be given quietly, being passed along, the relieved and relieving platoons will change places. The company commander of the relieving company will then supervise the posting of sentries by his platoon commanders. He will satisfy himself that each post is properly relieved and that the orders for the post are correctly handed over. The greatest care and attention to detail are necessary in this.

The exact frontage for which each platoon commander is responsible will be clearly defined.

Before dismissing his company the company commander will insure that each man has an alarm post from which he can use his rifle freely, and fire at the bottom of our own wire entanglements. Each man must also know the position of company headquarters, the reserve ammunition, and latrines. Every company commander in the front line will have control of the grenadiers employed on his front.

(9) Within twenty-four hours of taking over

a new line of trenches a company commander will forward a report on his trenches as follows:

Garrison of trenches.
Field of fire.
Distance from enemy's trenches.
General condition of trench.
Whether every man has a post from which he can fire at the bottom of our own wire entanglements.
Number of efficient loopholes.
Whether the parapet is bullet-proof throughout.
Whether there are sufficient traverses.
State of our wire.
State of enemy's wire.
Drainage.
Number of boxes of reserve ammunition.
Number of bombing-posts and of bombs with each.
Number of round of Very pistol ammunition.
Number of Vermorel sprayers.
Number of gongs.

A rough sketch showing the position of bomber's posts, machine guns, grenade stores, and reserve ammunition should accompany the report.

(10) Before handing over trenches, officers commanding companies will draw up a statement containing all available information on the following points:

Our own trenches and wire.
The enemy's trenches and wire.
Habits of the enemy.
Any part of trench which receives more than ordinary attention from the enemy's guns.
Number of bombing-posts and bombs at each.
Number of machine guns on company's front.
Work in hand or contemplated.
What artillery covers the front, and how it is best and most quickly obtained.

A list of trench stores, ammunition, etc., will also be drawn up ready for handing over. All stores should be carefully stacked in a convenient place. Ammunition, Very lights, sandbags, etc., sufficient for at least twenty-four hours' consumption, should invariably be handed over to the relieving unit.

(11) The following constitute trench stores and will be handed over on relief:

S.A.A.	Rifle racks.
Shovels.	Rifle grenade firing stands.
Picks.	Hand grenades.
Loophole plates.	Very pistol cartridges.
Balers.	Gongs, bells, and alarms.
Fixed rifle batteries.	Vermorel sprayers.
Sniperscope rifles.	Pumps.
Braziers.	Rifle grenades.
Catapults.	Reserve rations.
Grenade-throwers.	

The following will not be handed over:

Very pistols.
Pistols, illuminating, 1½ inch.
Telescopic rifles.
Periscopes.
Telephones.

Battalion picks and shovels will not be taken to the trenches. Should the existing tools in the trenches be considered insufficient, application should be made to brigade headquarters for a further supply.

2. SENTRIES.

As a general rule the following numbers of sentries will be posted:

By day: One sentry for every three bays, exclusive of bombers, snipers, and machine gunners.

By night: In a fog or snowstorm, one sentry for each bay, exclusive of bombers and machine gunners.

Sentries will invariably be posted and relieved by an N.C.O. under the orders of the platoon commander.

It must be recognized that no fixed rules can be laid down as regards the number of sentries that are necessary and battalion commanders will use their discretion in the matter. The number required will depend on the proximity of the enemy, the tactical situation, and, above all, on the state of our own wire entanglements.

3. OFFICER AND N.C.O.'s OF THE "WATCH."

In every company on the firing line the company commander will arrange for his officers to be on "watch" in turns throughout the twenty-four hours.

Likewise in each platoon the platoon commander will detail an N.C.O. of the watch.

The Officer and N.C.O.'s of the watch will visit all sentries, bombing-posts and machine guns within the area of their command once every hour by day and by night.

At night the officer of the watch will carry a Very pistol. Very lights should be used sparingly, as they are often difficult to obtain.

The time when lights are most required is when the Germans are not sending any up.

4. STANDING TO ARMS.

Troops will always stand to arms one hour before daylight and one hour before dark. They will remain under arms in the first instance until the enemy's lines are visible, and in the second instance until darkness comes on. At these hours company commanders will arrange for the inspection of arms, ammunition, and equipment by platoon commanders. The latter will satisfy themselves that each man is in possession of two smoke helmets, ammunition will be made up to one hundred and twenty rounds per rifle when troops stand to arms.

Whenever men stand to arms company commanders will order the parapet to be manned to insure that every man has a post from which he can fire at the bottom of our own wire.

At the inspection of rifles at the hours of standing to arms, platoon commanders will satisfy themselves that the bolt action is working freely. A thorough inspection of arms will be held at midday, at which hour men will be washed and shaved.

5. GAS ATTACKS.

(1) It is to be impressed on all ranks that the smoke helmet issued to them affords complete protection against all forms of gas used by the enemy.

(2) All ranks will invariably carry on their persons two smoke helmets. Instruction is to be given in the method of adjusting smoke helmets rapidly, condemned helmets being used for this purpose.

(3) Smoke helmets will be inspected at morning and evening "stand to."

(4) The direction of the wind will be studied and special precautions taken when it favors a gas attack by the enemy.

(5) On the first sign of gas, whether it is detected by sight or smell, the sentries will sound the alarm gongs and bells which are hung up at intervals throughout the trenches. On hearing this alarm every officer and man will at once adjust his smoke helmet and fall in on his alarm post. Nobody will remain in dugouts. To make certain of the warning reaching everybody, the order, "Put on smoke helmets," will be passed from man to man throughout the trenches held by the division.

(6) The officers in command of the trenches

opposite the section of the enemy's lines from which the gas is proceeding will send the S.O.S call to the artillery, and will order rapid fire to be opened on the enemy trenches. Neighboring sectors of defence will be at once warned.

(7) When the gas cloud is sufficiently thick to hide the enemy's front parapets, machine guns and rifles will open fire in short bursts on fixed lines covering the enemy's trenches, in order to inflict casualties, pierce gas tubes, and break up the density of the enemy's gas cloud.

(8) Garrisons of trenches on the flanks of the front threatened will be prepared to open a flanking fire on the enemy should he attempt to advance from his front line.

(9) As soon as the S.O.S. call has been sent to the artillery, messages will be sent to brigade headquarters and battalion headquarters.

(10) Rifle bolts and machine-gun crank handles are to be worked backwards and forwards while gas is about, to prevent the gas from impairing the action.

(11) Vermorel sprayers are to be used in trenches and dugouts in the affected area as soon as the gas has passed over, in order that gas helmets may be taken off.

(12) Measures will be taken to prevent stragglers.

6. FIXING OF BAYONETS.

Bayonets will always be fixed during the hours of darkness, during a snowstorm, or thick mist, or when the proximity of the enemy renders this course advisable.

7. COUNTER-ATTACKS.

As soon as possible after taking over a new line, the battalion commanders will draw up and submit to brigade headquarters their scheme for counter-attacking the enemy should he gain possession of any part of their line.

In framing this scheme it must be borne in mind that in every line of trenches there are certain points which would be of value to the enemy if captured by him, whereas there are others which would be of little use to him.

Should the enemy attack and occupy any portion of our trenches he will be immediately counter-attacked and driven out by the nearest body of troops. All ranks must clearly understand that counter-attacks made at once and without hesitation will usually be successful, even if made by small numbers, but that a counter-attack, once the enemy has been given time to establish himself, is a very difficult and costly operation.

8. MINES.

Should the enemy fire a mine in or near our trenches the crater thus formed will be immediately occupied by the nearest troops. This order will be made known to all ranks.

9. FIRING BY DAY AND NIGHT.

By day men will fire only when a target offers itself. If the enemy is in the habit of showing himself at any particular point, the attention of the platoon commander should be drawn to it. The latter will inform the battalion sniping officer, who will tell off a sniper's post to watch the spot.

By night all firing must be organized. If the enemy is believed to be working on his trenches or wire, the company commander will give directions to his platoon commanders to fire five rounds rapidly at certain stated times. He will first ascertain that no patrols from neighboring companies will be out at these hours.

A certain number of fixed rifles will be placed in every trench and fired by the sentries. These rifles will be laid on certain selected spots.

Indiscriminate firing by day or night is forbidden. If the enemy attacks, rapid fire will be opened without waiting for orders.

10. COMPANY MEETINGS.

Officers commanding companies will hold meetings of their platoon commanders and N.C.O.'s each evening in the trenches. Only a few officers and N.C.O.'s should be present at each meeting. At these meetings the following points should be discussed:

Work required to place our trenches in a better state of defence and to improve the comfort of the men.

Work to be done during the next twenty-four hours.

It is essential that all work which has to be carried out at night should be explained to all N.C.O.'s in daylight.

Any alterations noticed in the enemy's trenches or wire.

What steps can be taken to annoy and harass the enemy.

Action in case of attack.

11. WORK ON TRENCHES.

Work on trenches should as far as possible be carried out during daylight.

12. GARRISONS OF TRENCHES.

It is an invariable rule that, during daylight, the front-line trenches should be held as lightly

as is compatible with safety. At night the garrison must be strengthened.

The actual strength of garrison will be governed by the tactical situation and by the number of support and communication trenches at hand.

With proper support and communicating trenches only sentries and snipers should be in the front-line trenches during daylight. To these will be added bombers if there are any old communication trenches leading to the enemy's lines, or if the proximity of the enemy demands their presence.

13. DISCIPLINE.

(1) Sleeping in the front-line trenches will not be allowed unless there is an absence of proper support trenches.

(2) No dugouts will be constructed without the permission of the battalion commander. All dugouts must be made splinter-proof. Work on them will not be commenced until sufficient material is at hand. If it can be avoided, dugouts will not be constructed in the fire trenches.

(3) No man will leave the trenches without permission from an officer. This order will be made known to all ranks.

(4) Cooking should not take place in the front-line trenches. Whenever possible cooking will be done under company arrangements in order that the men may have their meals at regular hours. Washing and shaving should be carried out in support trenches when possible.

(5). All parties moving within the trench area will be correctly marched by an officer or N.C.O.

(6) Orderly room should be held daily in the trenches unless circumstances render this impossible.

(7) Sentries are strictly forbidden to wear any covering over the ears.

(8) An officer will always be present when an issue of rum takes place.

(9) Equipment will never be taken off in the front-line trenches except in the case of working parties, when equipment may be removed by order of the company commanders. In support trenches equipment may be removed at the discretion of battalion commanders.

(10) Sentries will remain standing at all times unless the height of the parapet renders this impossible.

(11) All parties, except stretcher-bearers, moving in the trench area will wear their arms and

equipment at the discretion of the commanding officers.

(12) The wearing of cotton bandoliers by working parties and orderlies is forbidden, nor are these bandoliers to be hung up in the trenches.

(13) Ammunition must be kept in a thoroughly clean state. If the ammunition is not clean jambs will occur. Ammunition will be frequently inspected.

(14) "Undercutting" trenches is strictly forbidden. Drains will always be cut down the centre of a trench and not at the sides.

(15) When mining is in progress in any of the trenches occupied by the brigade, the sandbags filled with earth from the mine will on no account be used in the front trenches or at other points which are visible to the enemy.

14. RECONNAISSANCE AND PATROLLING.

The best security against attack is active patrolling and constant observation of the enemy's lines, so that he cannot undertake any new work without steps being taken to prevent its continuance.

The enemy's wire will be constantly patrolled to insure that he has cut no gaps in it with a view to launching an attack.

Patrols will also frequently visit our wire to insure that it is efficient.

The front of our own fire parapet should be examined nightly.

15. INFORMATION.

Every effort will be made by means of patrols, field-glasses, etc., to ascertain information about the enemy, his trenches and wire. Any alterations in the enemy's lines must be reported, and if any of the enemy are seen a report will be sent in stating what dress they were wearing. The importance of forwarding all such information will be impressed on all ranks.

16. SNIPING.

In every battalion a sniping section will be formed, consisting of one officer and twenty-five N.C.O.'s and men. The officer will carry out the duties of intelligence officer to his battalion. He will render a daily report to his commanding officer containing the following information:

Number of casualties known to have been inflicted on the enemy.

Number and location of snipers' posts.

Any alterations in the enemy's trenches or wire.

Number of telescope rifles in possession.
Number and location of fixed rifles and rifle batteries in action.
Any activity by the enemy.

Battalion sniping officers will get into close touch with artillery observing officers, within their sector, and will give every assistance to them.

17. ARTILLERY SUPPORT.

As a general rule a forward observing officer of an eighteen-pounder battery will be quartered at or near battalion headquarters.

Requests for retaliation should be made to this officer and brigade headquarters should be warned of the action taken.

Fire from howitzers and heavy batteries can, except in the case of the S.O.S. signal, only be obtained through brigade headquarters. If retaliatory fire is required from howitzers, it must be stated on what point it is wished that the fire should be directed.

Any trench mortaring by the enemy should be immediately reported to the officer commanding our trench mortars.

18. "S.O.S." AND "TEST" SIGNALS.

In the event of an infantry attack by the enemy, a mine being fired, or other emergency,

the S.O.S. signal will be sent by the quickest route to the field artillery battery covering the trenches concerned.

The signal will be followed by the number of the trench; e.g., "S.O.S. B 4."

The signal will be repeated to battalion headquarters, who will transmit it to brigade headquarters.

On receipt of the S.O.S. signal all batteries covering the trenches concerned will open a concentrated fire on the enemy's front line.

When necessity for fire no longer exists a message to this effect will be sent to the artillery and to brigade headquarters.

In order to test the efficient working of the artillery lines "test" messages will frequently be sent from the trenches to the supporting battery.

The number of the trench will always be sent; e.g., "Test A 6."

The test will consist of one round of shrapnel fired on the "night line" of the battery. No target will be given by the officer in the trenches.

The time taken from the handing-in of the message until the shell bursts will be carefully noted and reported to the battalion headquarters. The officer commanding the battalion will enter the result of all tests in his daily report. He will

give the exact time at which the test was sent and will state whether it was a "direct" or an "indirect" test. A "direct" test is from trench to battery. An "indirect" test is from trench via battalion headquarters to battery.

19. VERMOREL SPRAYERS.

One man will be detailed to look after each sprayer. A spare tin of solution will be kept with each sprayer. Medical officers will periodically inspect both sprayers and solution.

20. HOSTILE ARTILLERY FIRE.

In reporting activity by the enemy's artillery it is necessary to state:

(1) The time at which shelling began and when it ceased.
(2) Your own position.
(3) Whether howitzer or gun.
(4) Direction from which shells arrive. Compass bearing should be given if possible.
(5) Whether shells burst in the air or on "graze."

In reporting results of our own fire, state:

(1) Your own position.
(2) Estimate distance short, over, right or left, in yards. Avoid vague statements.

(3) Whether gun or howitzer.

(4) Whether shrapnel or high explosive.

If shrapnel burst in the air judge whether range is correct by the splash of the bullets on the ground and not by the burst.

21. AIRCRAFT.

On the approach of any of the enemy's aircraft, three blasts will be blown on a whistle. This will be the signal for all ranks to keep perfectly still.

One blast on a whistle will indicate that the aircraft has moved away.

All aircraft belonging to the enemy will be heavily fired on by machine guns and rifles as long as they are within range, but no firing will take place without the order of an officer, who will first satisfy himself that the aircraft is hostile. Directions should be given to the men as to how many lengths in front of the aeroplane aim should be taken. If a "Zeppelin" is sighted a "priority" message will be sent to brigade headquarters reporting the fact, and stating approximately where the "Zeppelin" was seen and in what direction it was proceeding.

22. MAPS.

Maps with our own trenches marked on them will not be taken into the front-line trenches.

23. TELEPHONE MESSAGES.

No messages regarding the action of our own artillery or other matters of important nature will be sent by telephone to the fire trenches. Such messages will be sent by orderly. This is necessary because it has been found that the enemy has, at times, read our message by induction.

24. SIGNALLERS.

The brigade signalling section is responsible for the maintenance of communication between brigade headquarters and battalions.

Battalion signallers are responsible for communications within the battalion.

All wires must be pinned in to the sides of trenches. Infantry wires on the south and east sides and artillery wires on the north and west sides.

Pins for this purpose can be obtained from brigade headquarters.

All wires will be labelled with the name of the battalion at least every fifty yards.

Officers in charge of battalion signallers are responsible that all disused or unlabelled wires within their areas are reeled up.

All wires will be patrolled at least once every twenty-four hours.

25. MEDICAL OFFICERS.

Medical officers attached to battalions will, in addition to looking after the sick and wounded, be responsible for the sanitation of the trenches generally, paying particular attention to water supply and latrines. Battalion sanitary sections will work under the orders of the medical officer.

The medical officer will accompany the commanding officer periodically on his visits round the trenches.

Stretcher-bearers are responsible that the rifles and equipment (including field-glasses, wire-cutters, etc.) of all men who are wounded are taken with them to the dressing-station. The medical officer will instruct the N.C.O. stretcher-bearers to see that this order is carried out.

The arms and equipment of wounded men will be sent to the field ambulance with them, the ammunition having first been removed from pouches and magazine. Field-glasses, wire-cutters, etc., will not be sent to the field ambulance, but will be sent to battalion headquarters.

The arms and equipment of men who are killed will be collected at battalion headquarters and handed over to the quartermaster for return to the base.

26. RATION PARTIES.

Parties to carry rations, water, and material to the companies in the front line will be detailed from the companies in reserve.

27. EMPTY CARTRIDGE CASES AND RUBBISH.

At intervals throughout the trenches sandbags will be hung up as receptacles for empty cartridge cases and chargers. Others will be hung up for the collection of rubbish. Sandbags to be labelled accordingly. All empty cases and chargers thus collected will be sent each evening to battalion headquarters for transmission to the base.

28. DRESS, ETC.

Men must be properly dressed at all times and as smart and clean as circumstances will allow.

All men must shave daily.

Discipline as regards saluting, standing to attention, etc., will receive as much attention in the trenches as in billets.

29. PRISONERS.

Should any prisoners be captured they will be immediately searched, and all documents

found on them will be forwarded to brigade headquarters without delay. Germans usually carry documents in the skirt pockets of their tunics. A telephone message will be despatched to brigade headquarters stating to what regiment the prisoner belongs.

All ranks will be warned that should they find themselves in the hands of the enemy, it is only necessary for them to give their number, name, and regiment. No other information whatever will be given.

30. RETURNS.

The following returns are due at brigade headquarters daily when in the trenches:

At 5.15 A.M. Situation and wind. By telephone.

At 11.00 A.M. Strength and casualty return.

Daily report on typed form. By orderly.

Artillery intelligence report. By orderly.

At 4.00 P.M. Situation and wind. By telephone.

At 5.30 P.M. Intelligence report. By orderly or telephone.

At 9.00 P.M. Return of material required for trench construction to be sent up the following evening. By telephone.

Activity by the enemy's aeroplanes will always be reported.

It is to be remembered by all officers that it must be considered a point of honor that they shall hand over any trench under their command in a better condition than that in which they received it; that is, every good officer makes it a point to make some improvement on a trench before handing it over to his successor.

Method of marching into trenches. Battalions will march into trenches by platoons, keeping well to the right of the road with a road interval of at least two hundred yards between platoons. Should the enemy bombard the road along which the troops are marching, it may be necessary to make a détour, or else to divide each platoon into four sections with a road interval between sections of at least one hundred and fifty yards. If at all possible, however, troops must not be marched through a bombarded area, but should make a détour.

When approaching a part of the road where lights would be easily visible by the enemy, all

smoking must be stopped and no unnecessary noise allowed. Strict march discipline must be maintained on the way; also officers will be detailed to march in the rear of each body of troops to keep them well closed up so that no straggling shall occur.

It must be remembered that only a limited number of roads are available over which an immense amount of traffic has to pass. Therefore any unnecessary delay caused by a body of troops will cause great congestion for several miles.

As the troops approach more closely to the line, it may be necessary for them to go in single file so as to offer a lesser target to enemy machine guns or fixed rifle batteries. As soon as the communication trench is reached, the troops should proceed along it at a rather slow pace in order that the rear may keep up with the pace of the leaders. In fact with new troops it may be necessary to make frequent halts in order that the rear of the column may not be lost in the communication trenches.

Any man who leaves the ranks without receiving permission should be most severely dealt with.

The above applies to troops leaving the

trenches also. All ranks must be kept out of shallow dugouts during shell fire.

When to ask for retaliation. The knowledge that you have behind you the strongest artillery in the world and also the splendid accuracy of our gunners should add greatly to the morale of our troops, and under no circumstances should a company commander allow his men to be punished by enemy artillery fire without asking for retaliation. As soon as casualties occur, caused by enemy shells directed at your trench, it is advisable to report the same immediately, stating whether or not you wish retaliation, and as such retaliation usually takes the form of about ten times as many shells being directed at the enemy trenches and batteries, the enemy almost immediately stop shelling you. During the past winter it was practically an order that if the enemy sent over ten shells, our artillery replied with one hundred, and if the enemy used ten trench mortar bombs, our Stokes gun batteries replied with about one hundred and fifty. In this way by giving the enemy ten to fifteen times as much as he sent his practise of annoying us was made very costly and consequently he did not do it so often.

It is a good plan to impress upon your men

the fact that we have a tremendous superiority in artillery and munitions, and any time that the enemy starts something we can immediately reply with ten times as much as he sends. In this way the morale of the men will be greatly bettered and they will enter into the contest with a feeling of confidence that they have behind them a sure and powerful force which will assist them on to victory.

Communication. Under no circumstances must any important message dealing with movements of troops or attacks, or any message which would be of value to the enemy, be telephoned from the front line to the rear except in case of great emergency, and should the telephone be used for this purpose it is advisable for the signallers of the battalion to work out a local code which should be well known by all signallers and by the adjutant and company commanders. This code should be one that it would be impossible to decipher, the reason being that we ourselves have a method by which we can obtain by induction the telephone messages which the enemy sends over his line, and we believe that he has a similar method of reading our messages.

Some months ago, by the use of this machine we learned about an impending attack, and by

turning our artillery on the enemy trenches from whence the attack was to be launched we caused him tremendous casualties.

Trench warfare is simply an application of the principles dictated by common sense, taking advantage of the knowledge which we have accumulated and paid for with many thousands of lives, and no officer, no matter how high his rank, should be above taking instruction in any part of trench warfare. You can never learn too much about it and the more you learn the better you will be able to protect the lives of those for whom you are responsible, and you will be able to do more to achieve the result which we are all aiming for, namely, the victory over the enemy.

IX

TRENCH HYGIENE

THE necessity of maintaining absolute cleanliness in the trenches is most important and every effort must be made with this end in view. Sanitary squads should be told off for the collection of garbage and the cleaning of the latrines. The matter from the latrines should be taken to deep shell holes well clear of the line and buried, being first covered with chloride of lime. The latrine pails should be cleaned and disinfected. Latrine seats should be scrubbed and disinfected daily.

Garbage receptacles should be placed at frequent intervals in the trenches and the men ordered to place all particles of food or refuse of every kind in these receptacles. These receptacles should be cleaned daily; old tin cans and other food containers should be placed in them.

The men should provide themselves with a good insect powder. Any man contracting a contagious or venereal disease should immediately report to the medical officers and very severe penalties should be inflicted upon those who dis-

obey this order. A plentiful supply of blue ointment should be kept by stretcher-bearers for the use of the troops and instructions given as to the method of using it.

Malingerers will frequently be discovered among the men, and an extra dose of No. 9 pills has been found an effective cure for this disease. However, should malingering be persisted in, severe penalties should be inflicted.

The battalion medical officer is responsible for the sanitation of the battalion area and he is assisted in this work by a sanitary squad which may be as large as required. Any officer handing over dirty trenches should be immediately reported to headquarters for disciplinary action.

X

BILLETING AND TRAINING OF TROOPS IN REAR OF LINE

TRAINING

ORDINARY garrison duty in the trenches has a tendency to make men slouchy and soft, and it is necessary that a special syllabus of training should be drawn up for them so that when they go to brigade or divisional rest after their tour in the trenches they will regain some of the smartness which they formerly had.

It is also necessary that they should receive considerable close-order drill and extended-order drill, particular attention being paid to discipline which includes saluting.

It is a well-known fact that a soldier who has nothing to do immediately finds time to think about alleged grievances and to grumble, and we have found that the best way to keep our men contented and happy is to give them lots to do.

A battalion coming out of the trenches usually arrives at its billets about three or four o'clock in the morning. If possible breakfast should be immediately served to the men. They are then

allowed to sleep until about noon, when dinner will be served.

A police picket should be placed around the battalion lines with instructions not to allow any soldier to pass except during liberty hours which will be specified. The picket also will have instructions to see that every soldier passing is properly dressed, clean-shaven, and carries his gas helmets.

The afternoon of the first day is generally given over to the soldiers for the purpose of cleaning up and rest, and about four o'clock liberty will be allowed should there be a French town open to troops in the battalion area. The following morning platoon commanders should exercise their platoons in physical training and bayonet fighting; also close-order drill, including platoon section drill. It is a good plan to practise men each day in the inspection of gas helmets and platoon commanders should obtain a sufficient supply of condemned helmets for practice purposes and drill his men in the different formations with these helmets on. In this way the men will become accustomed to wearing the helmet and will not feel any strangeness to it should they be required to put on their helmets when in the line. It is absolutely forbidden for the service

gas helmet to be used for practice in rear of the line, as constant exposure to the air has the effect of reducing the strength of the chemicals with which the helmet is impregnated.

Battalion commanders should have their officers arrange a system of battalion sports, and it will generally be found that the men will willingly coöperate with the officers in organizing these sports. Small prizes of money donated by the officers will add interest to the various events and athletic rivalry between companies should be encouraged. Baseball, football, running races, broad jump, hurdles, indoor baseball, tennis, swimming — if a supervised pool is available. Any game which has the element of fun and sport and gives physical training should be encouraged.

It will be found that a few of the men will take no interest in these sports, and will endeavor to evade going to them. These men should be carefully noted and detailed for fatigues, and when they find that they are being insistently placed on this kind of work, while their comrades are enjoying the sports, they will generally decide to attend the sports in the future.

In giving physical training the element of fun should be introduced as much as possible so as to

maintain the men's interest and to put "pep" into the work. Various training games have been devised for this purpose.

The strap game. A circle of about twenty men is formed, each man bending slightly inwards, with his eyes on the ground, his hands behind his back. The instructor takes a short leather strap and passing around the outside of the circle passes the strap secretly to the hands of one of the men. The instructor continues his walk around the circle. The man, waiting a few moments, suddenly turns on his companion on his right and commences beating him. The beaten man must run around the outside of the circle and regain his original place, the other man continuing to chase him around until he arrives there. The beaten man, arriving at his place, takes the strap and walks around the outside of the circle, placing it in the hands of some other man who continues the action as above.

This game is well liked by the men and is splendid physical training.

The jumping game. About twenty or twenty-five men are arranged in a circle with the instructor in the middle. A sandbag filled with about three pounds of soft earth, and tied to a rope about twelve feet long, is swung by the in-

structor at a height of about twelve inches from the ground in a gradually increasing swing, so that eventually the bag reaches the circle, and as the bag comes to a man, he must jump so that it will pass underneath him. If the bag should hit the man, he must then take the instructor's place in the centre of the circle and swing the bag; and so on.

Passing the buck. Several teams of from ten to fifteen men are arranged facing the instructor, each team in single file. The men bend over as in leapfrog, the captain of each team being in front. The instructor has a number of objects of equal weight (about two pounds), and on a given signal he throws these at the same time to the captain of each team. The captain immediately passes the object underneath his legs to the men in the rear, and they pass it along until the last man of each team gets it, when the last man immediately runs up and places himself in front of the captain and continues passing the article back again. This is carried on until the teams resume their original formation with the captain in front, and the last man who gets the article must run up and tag the instructor. Whichever team tags the instructor first wins the game.

Two ranks fall in. All physical training should

be started with this move. The men are told that when the instructor gives the order, "Two ranks fall in," they are to move at the same speed as he does and in the same direction, and that when the instructor halts, the first man who places himself two paces in front of the instructor will be the right-hand man of the front rank, the remainder immediately falling in in any position they can so as to complete the two ranks quickly. The men must be warned that they are not to touch the instructor or interfere with his movements. The instructor, as soon as he gives this command, should run as fast as he can for about fifty or one hundred yards, frequently changing his direction. This game also has the element of fun in it because it is always the endeavor of the men to beat the instructor out. The instructor should be careful to watch that all the men participate energetically.

Discipline should be strictly maintained when in rest billets and buttons and boots polished, clothes cleaned, and the men should shave daily. Officers should always be saluted and should return the salute.

BILLETING

The billeting party generally consists of one officer and four N.C.O.'s (company quartermaster sergeants). The billeting parties of each battalion generally move to the front of the column, where they are taken charge of by the brigade billeting officer who directs which villages shall be occupied by each battalion.

The billeting party will then proceed to the village named and report to the town major, an officer permanently detailed to reside in this village and responsible for the billets in it. The town major will assign certain portions of the village to the battalion, and the battalion billeting officer will then proceed to assign these billets to the different companies, endeavoring to keep each company as much together as possible. The quartermaster sergeant will go around the billets assigned to his company, marking in chalk on the doors of the barns and houses the number of N.C.O.'s and men which each place will accommodate; also marking the number of the platoon and regiment on the door so that no confusion will arise when the battalion arrives. Care must be taken that the men are not billeted too close together. The quartermaster sergeant

should inspect these billets to see that they are thoroughly clean and should immediately report to the billeting officer any billets that are not clean.

The company commander should be located as near as possible in the centre of his company billets where he will establish the company office. Platoon commanders should be located near their platoons. The company field kitchen will be located either on the road near the company office or else in a farmyard near by.

The latrines of the inhabitants should not be used by troops, and if troop latrines have not already been provided, this must be immediately attended to, the bucket system being used and kept clean daily. The cleanliness of the latrines is generally the work of the battalion sanitary section who are under the direct control of the battalion medical officer.

Battalion headquarters should be located as near as possible in the centre of the battalion area. The battalion signallers on arrival should at once connect company headquarters with battalion headquarters by telephone, and the company signallers will remain on duty in the company office at all times, making arrangements among themselves for the relief.

A police picket should be maintained around the battalion area under the command of the regimental provost sergeant. The inhabitants of the village should not be allowed to travel promiscuously through the battalion area unless they have a special permit from the *maire* of the village to do so. Looting should be strictly suppressed and severely punished.

A point of assembly or alarm post should be located for each company and all the men notified of its location.

All refuse matter must be carefully collected and burned daily in the company incinerator. The platoon commander is held personally responsible for the cleanliness of his billets, and it is considered a serious offence to hand over dirty billets to incoming troops.

All drinking-water must be boiled or treated with chloride of lime before being used. Meals should be given the men at regular hours, and each platoon commander should visit his platoon at each meal to see that his men are getting sufficient to eat and that the food is well cooked and of the proper quality.

Arrangements should be made for the action to be taken in the event of the village being shelled by the enemy. Traffic patrols should be

posted at all crossroads in order to avoid congestion of traffic and to stop all traffic, including foot traffic, in the event of enemy aircraft arriving. A series of short blasts is the signal for all traffic to stop and one long blast the signal to carry on.

Where it is desired to billet troops in a village not previously used for that purpose, the battalion billeting officer should report to the *maire* of the village for a list of the billets, and it will be necessary to detail an interpreter to accompany the billeting party.

All disputes between troops and inhabitants should be referred to the assistant provost marshal or to the town major. All goods obtained from the inhabitants must be paid for in cash at the time, and should it be necessary to requisition any food, forage, or other material, the requisitioning must be done by the brigade officer whose duty this is.

The Army Service Corps delivers the food in bulk to the battalion quartermaster on the indent, the quartermaster in turn apportioning it to the different companies. Cleanliness and sanitation are most important and all officers should pay special attention to it.

During the daytime the men should be kept

out of the billets as much as possible and all billets should be well aired. Rifles should be cleaned daily.

It is customary, where a brigade is occupying the same rest billets for any considerable time, to establish brigade schools of instruction in bombing, bayonet fighting, and trench warfare. Full advantage should be taken of these schools to instruct the troops, especially the new men.

Company office and battalion orderly room should be held daily.

It is generally an order that no enlisted man is allowed to go farther than one hundred yards from his billets without a special pass, signed by his company commander, and with the regimental stamp on it.

Immediately upon arriving in billets from the line, battalion commanders should make arrangements for the use of divisional baths which are located in all billeting areas, and having been assigned certain days for the use of his battalion he will notify each company the time at which the baths will be available for them. Compulsory attendance at these bathing parades should be insisted upon.

On arrival at the baths, the men hand in their dirty underclothing and are issued soap and a

towel. Upon completion of the bath, they hand in the soap and towel and are issued clean underwear and towel. This towel must be handed in when the man next returns to the baths.

Men who have lice will hand in their outside clothing which will be disinfected in a steam disinfector. Men having itch will be given special sulphur baths.

Each platoon commander may indent on the divisional baths, through the battalion quartermaster, for a supply of extra socks to take into the trenches. The floors of billets should be scrubbed at frequent intervals. The men must be instructed that they are not to interfere with civilians who are occupying the same billets.

XI

SYLLABUS OF TRAINING

FOURTEEN WEEKS' TRAINING OF RECRUIT TO FIT HIM FOR FRONT

(1) The period of training for infantry recruits will be fourteen weeks divided as follows:

2 weeks' preliminary training.
12 weeks' training.

Any furlough that may be granted will not be counted as a portion of the period.

(2) During the two weeks' preliminary training, recruits should be vaccinated and inoculated, and arrangements should be made for the commencement of special dental or other treatment.

SYLLABUS FOR THE TRAINING OF INFANTRY RECRUITS

(1) Preliminary training, in the first and second weeks:

Light physical training.....	6	hours	per	week
Marching without arms.....	6	"	"	"
Squad drill without arms.....	6	"	"	"

Care of arms.....	18 hours per week
Care of equipment and kit....	
Anti-gas instruction.....	
Demonstration in fitting..	
marching order.....	
Lectures and inspections.....	

The aim should be gradually to accustom the recruit to military training, in order that he may be able to undertake the work laid down in the twelve weeks' training without undue strain. Physical training, drill, etc., should not last more than half an hour at a time, with lectures in between.

Short lectures should be given on:

Drill and musketry, including care of arms.
Discipline, saluting.
Crimes and punishments.
Interior economy, pay, messing.
Duties.
Conduct on active service.
Trench warfare (including bombing).
Protection.
Foreign uniforms.
Hygiene and sanitation.
Anti-gas measures.
First field dressing.
Visual training.
Regimental history.

Training	*Hours*
3d Week	
Physical training and marching	6
Bayonet training	3
Squad drill without arms	12
Musketry	18
Lectures and inspection of kit	3
Anti-gas instruction	1
4th Week	
Physical training	6
Bayonet training	3
Squad drill without arms	6
Squad drill with arms	6
Musketry	12
Lectures and kit inspection	3
Anti-gas instruction	1
Marching	3
Fitting marching order	3
5th Week	
Physical training	6
Bayonet training	3
Squad drill with arms	12
Musketry and miniature range	15
Lectures and kit inspection	3
Anti-gas instruction	1
Marching	3
Fitting marching order	3
6th Week	
Physical training	6
Bayonet training	3
Squad drill with arms	6
Extended order drill and signals	6
Musketry and miniature range	18
Lectures and kit inspection	3
Anti-gas instruction	1
Night work, sentry duties	3
7th Week	
Physical training	6
Bayonet training	6
Platoon drill	3
Extended order drill	3
Drill, marching order	3
Musketry and miniature range	18
Anti-gas instruction	1
Night work	3
Bombing	3

Training	*Hours*
8th Week	
Physical training	6
Bayonet training	6
Platoon drill, marching order	6
Extended order drill	3
Musketry and miniature range	9
Anti-gas instruction	*1
Night work	3
Bombing	3
Entrenching, filling and laying sandbags	9
9th Week	
Physical training	6
Bayonet training	6
Company drill, marching order	9
Musketry	18
Anti-gas instruction	1
Night work	3
Bombing	3
10th Week	
Physical training	6
Bayonet training	6
Drill, marching order	6
Musketry	6
Anti-gas instruction	1
Bombing	3
Entrenching	6
Field work / Route marching	12
11th Week	
Physical training	3
Bayonet training	3
Drill	3
Musketry	18
Anti-gas instruction	1
Bombing	3
Night work	3
Field work / Route marching	12
12th Week	
Physical training	6
Bayonet training	3
Drill	3
Musketry	12
Anti-gas instruction	1
Bombing	3
Entrenching / Entanglements / Field work / Route marching	18
13th Week	
Physical training	6
Bayonet training	6

* Two periods of half an hour each.

Training	*Hours*
Drill	6
Musketry	9
Anti-gas instruction	1
Bombing	6
Entrenching, Field work, Cooking in the field, Route marching	12

Training	*Hours*
14th Week	
Physical training	6
Bayonet training	6
Drill	6
Anti-gas instruction	*1
Bombing	9
Field work, Cooking in the field, Route marching	18

* These hours to be continuous.

NOTE. Throughout the course a portion of the time given to physical training will be allotted to physical exercises connected with bombing, and from the fifth week onwards to throwing dummy bombs.

XII

MORALE

THE importance of maintaining the high morale of the troops is great, and platoon commanders, by frequent lectures or talks with their men, can greatly assist in maintaining this morale.

The fact should be impressed upon our men that we are supported by the most powerful and accurate artillery in the world, and that we have all the shells that our artillery can fire and tremendous reserves.

Before going into an attack the troops should be told just how much artillery is back of them and what that artillery is going to do to the enemy, so that they can watch with periscopes, and it adds a great feeling of confidence to attacking troops to see enemy trench fortifications going up into the air, and also the punishment that is inflicted on the enemy in the preliminary bombardment.

It should be impressed upon our soldiers that they are the best troops on earth. We know that they are, but they should be made to feel that they are, and that they should govern their

actions accordingly. They should be made to feel that it will be a personal disgrace if they fail in any duty which they are ordered to perform.

We should teach them that we do not make war in a barbarous manner like the Huns, and that any methods of warfare which we employ are employed in the same spirit that methods of removing a scourge or a menace to civilization would be employed.

A platoon commander should get the newspapers from his home town and tell his men the local news which is of interest to them and pass these newspapers around. He should keep his men well informed on the progress of the war, not holding back any reverses which we may have suffered and let the men feel that they know as much about the inner workings of the army as the officer himself does. Nothing will destroy morale more quickly than the feeling that the higher officers are withholding news of some important reverse.

When an attack is intended, the troops taking part in that attack should be given every bit of information that is available both as to the object of the attack and the method that is going to be employed in carrying it out.

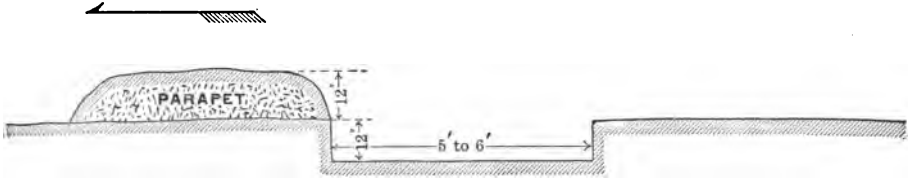
A good platoon commander should look after

the welfare of his men in every way. He should try to organize entertainments for them at night. He can promote a feeling of comradeship without in any way losing his dignity or lowering the discipline which he maintains. He should set an example to his men in all things, he should discourage drunkenness and gambling, and should advise his men on their personal matters, should they require such advice.

It will be found worth while, if you can discover a humorist in a platoon, to give this man all the preference you can so long as he will endeavor to keep his comrades amused. We have sometimes found that a man who was worthless as a soldier was worth his weight in gold on account of the amusement which he afforded his comrades, consequently keeping them in good spirits.

A platoon commander should see that his men write frequently to their folks at home. A platoon commander should always write a personal letter to the relatives of a man who has been killed or wounded, explaining how much the man's comrades regretted his loss, etc. In a general way anything which tends to keep the troops in good spirits, to keep them amused, and which keeps them away from harmful dissipations should be encouraged.

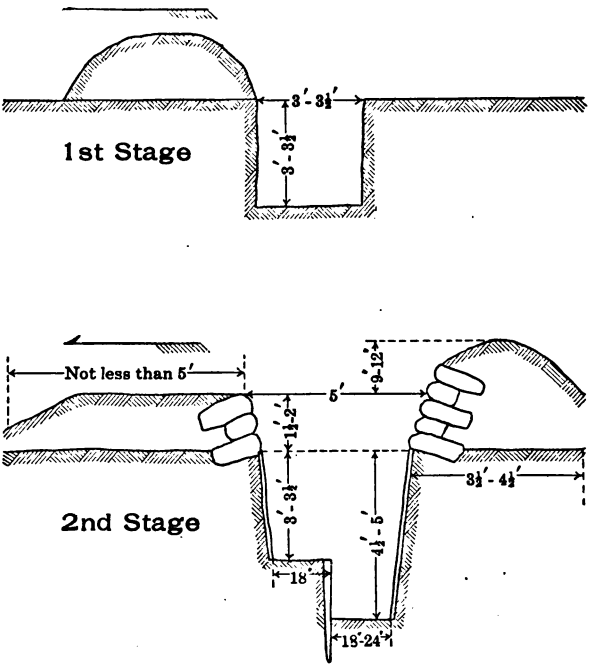
DIAGRAMS



Hasty Shelter Pit dug by soldier with his entrenching tool

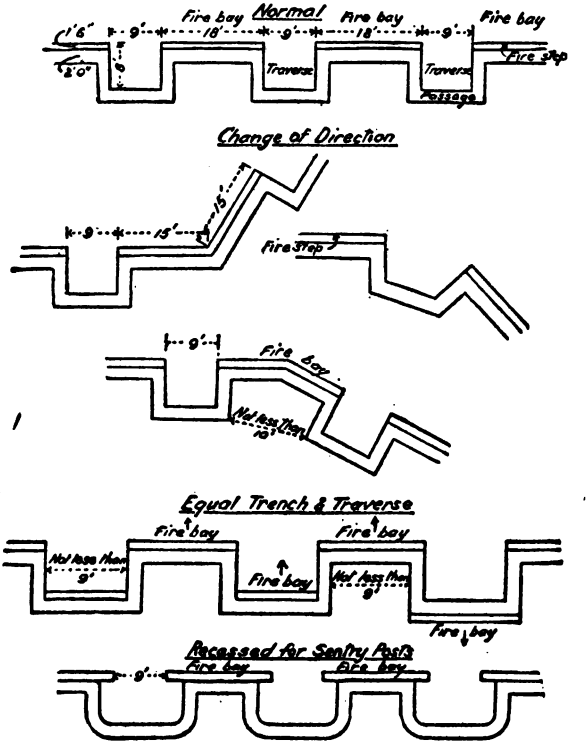
No. 1.

ORDINARY OR STANDARD TRENCH.



No. 2.

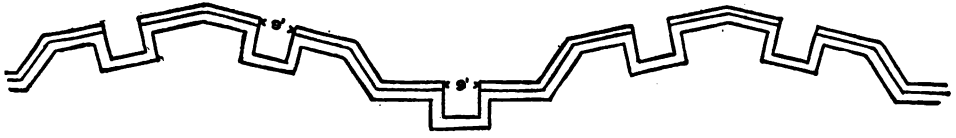
should not be too straight.



TRACE OF TRENCHES.

Flanking Redan.

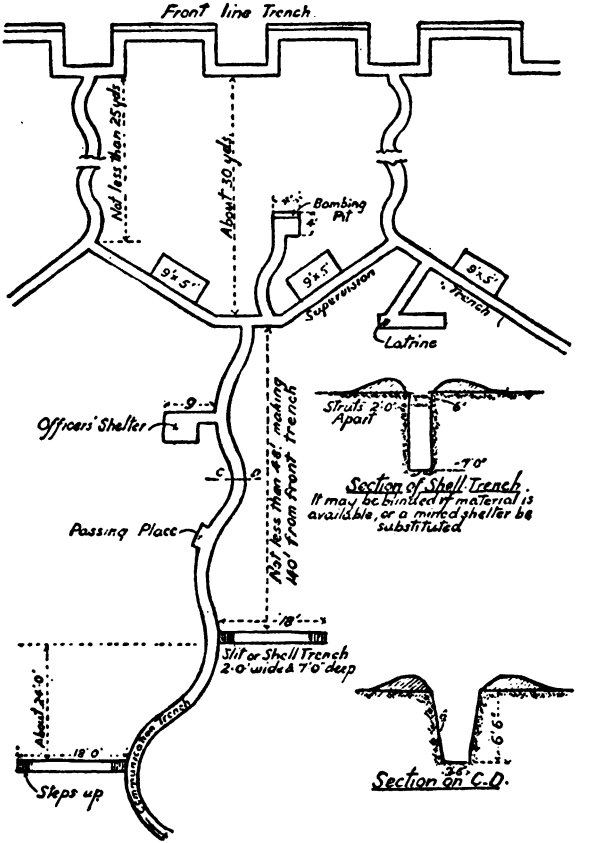
Bastioned.



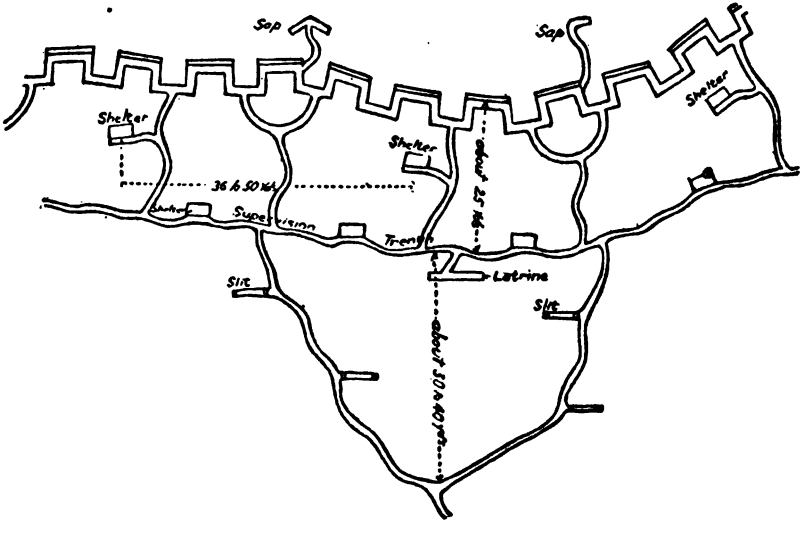
Dummy Trench or Trench to be Enfiladed.

not less than

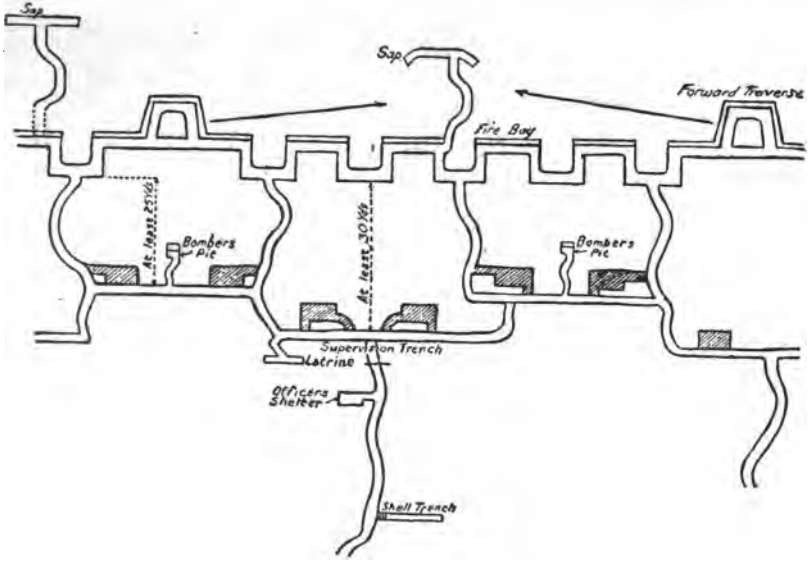
DIAGRAMMATIC SKETCH OF PORTION OF A FRONT LINE, WITH SUPERVISION TRENCH, LIVING DUG-OUTS AND SHELL TRENCHES.



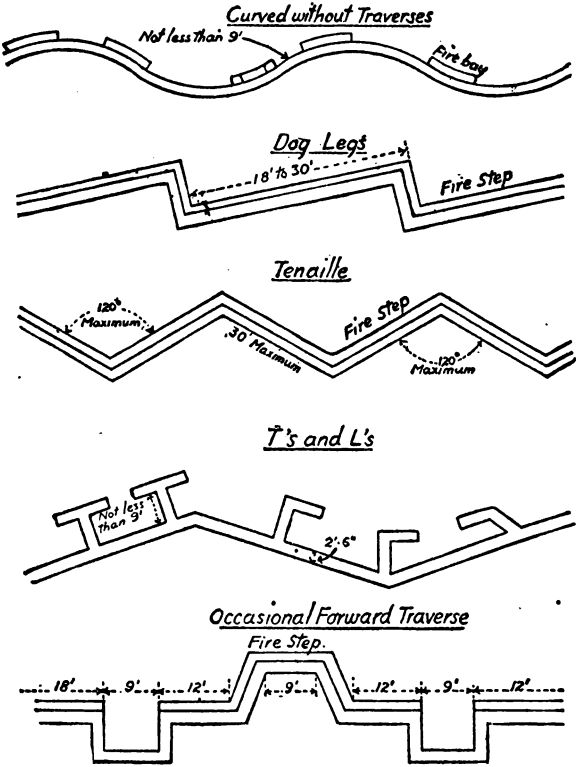
ALTERNATIVE DIAGRAMMATIC ORGANIZATION OF A FRONT LINE.

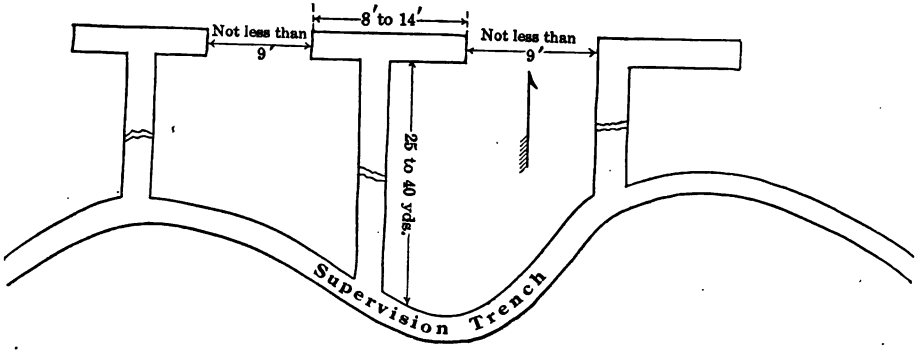


ALTERNATIVE DIAGRAMMATIC ORGANIZATION OF A FRONT LINE.



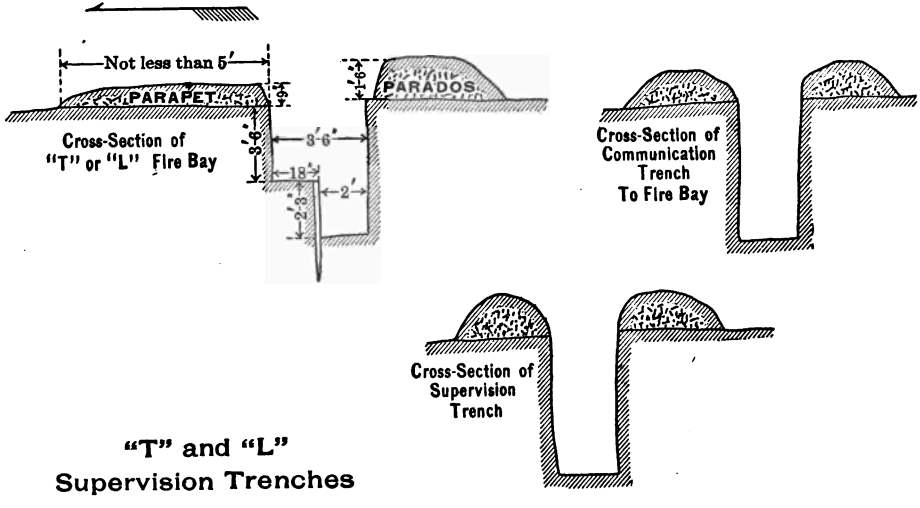
TRACE OF TRENCHES.





"T" and "L" Trenches with Supervision Trench

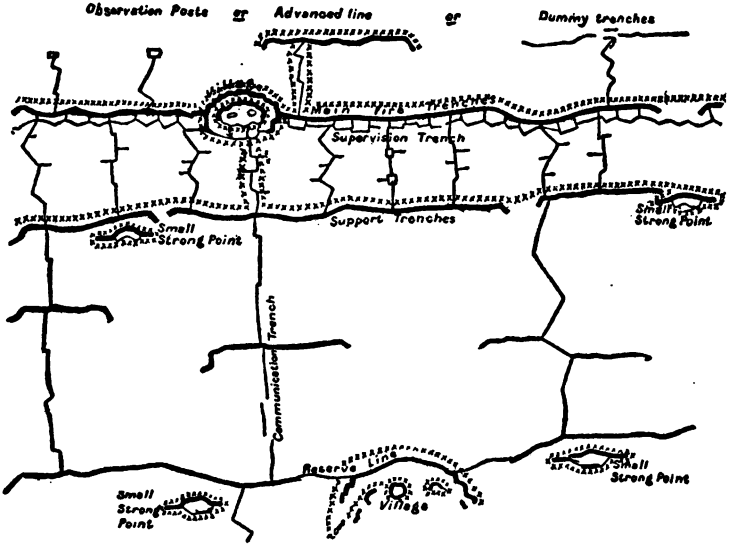
No. 10.



"T" and "L" Supervision Trenches

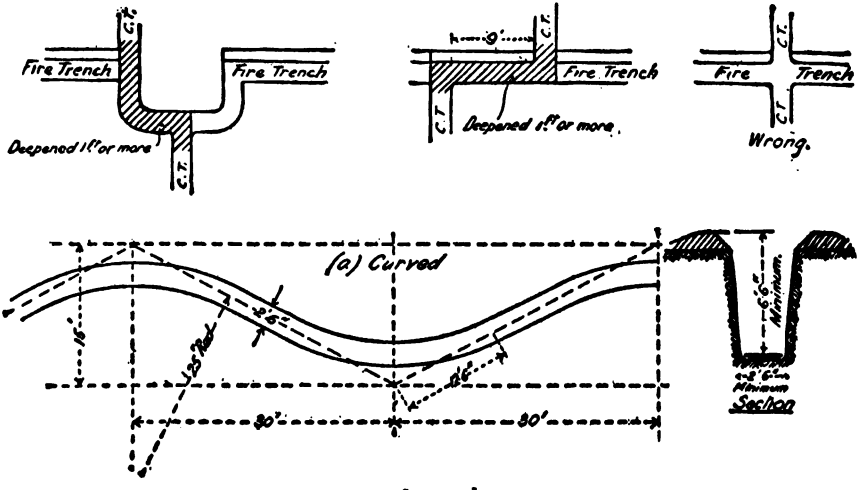
No. 11.

ARRANGEMENT OF DEFENSIVE LINE



COMMUNICATION TRENCHES.

C. T. Crossing a Trench



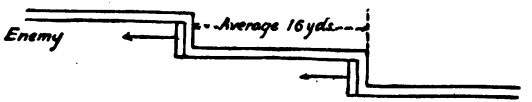
COMMUNICATION TRENCHES.

Plan depends on the ground; the length of legs should never be shorter than 9 ft. and not longer than 60 ft.

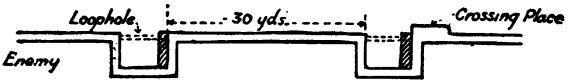
Short—downhill towards enemy; long—uphill.

(*b*) Zigzag.

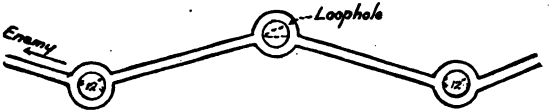
(*c*) Elbowed or Saw.



(*d*) Traversed.

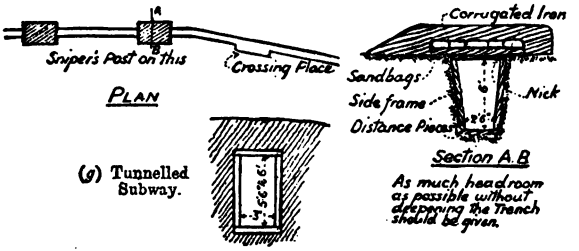


(*e*) Island Traverses.



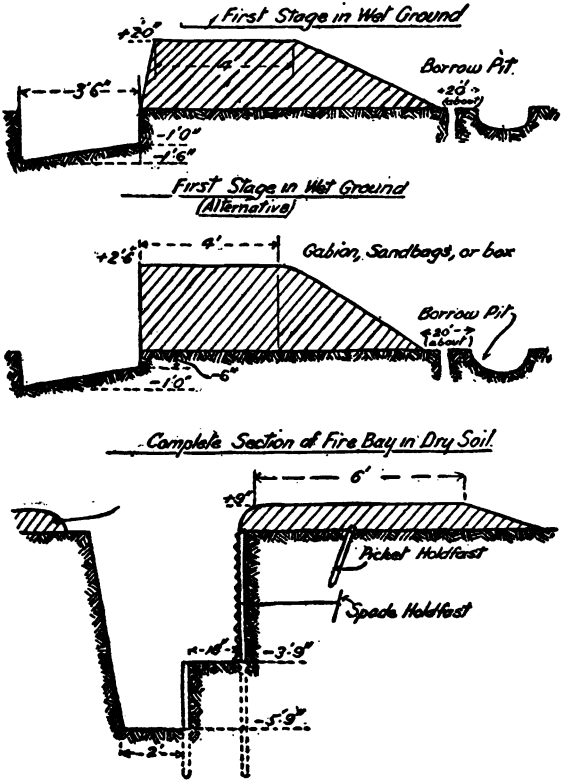
(*f*) Bridge Traverses.

(A trench may be blinded continuously in this way.)



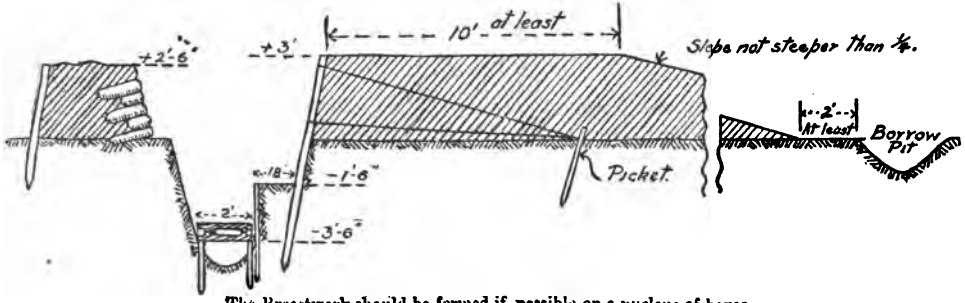
(*g*) Tunnelled Subway.

SECTIONS OF TRENCHES.



SECTIONS OF FIRE TRENCHES.

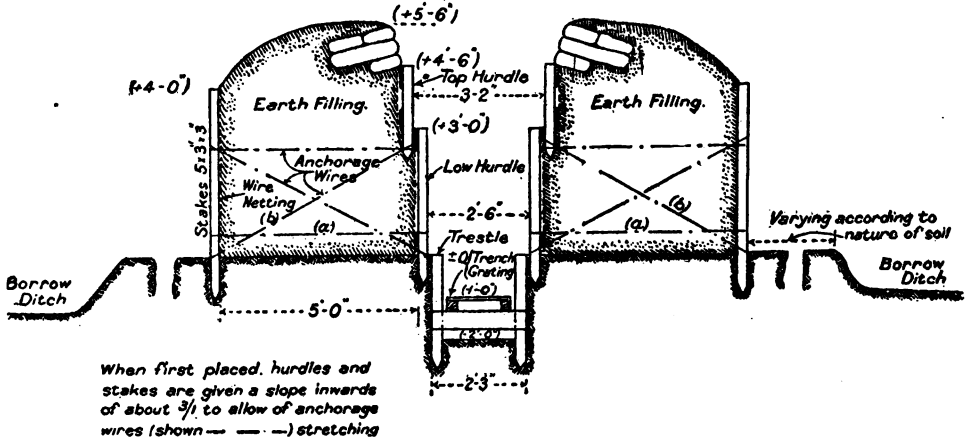
SECTION OF BREASTWORK IN WET SOIL.



The Breastwork should be formed if possible on a nucleus of boxes, gabions, etc., filled with earth.

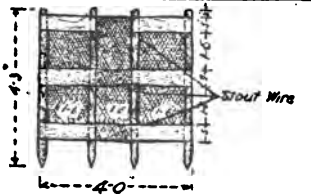
BREASTWORK AVENUE.

CROSS SECTION.

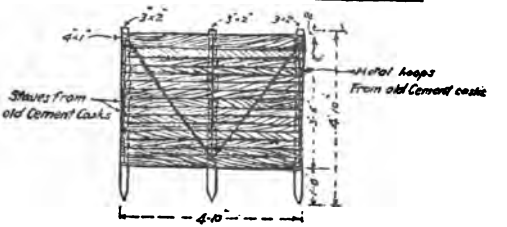


When first placed, hurdles and stakes are given a slope inwards of about 3/1 to allow of anchorage wires (shown — — — —) stretching

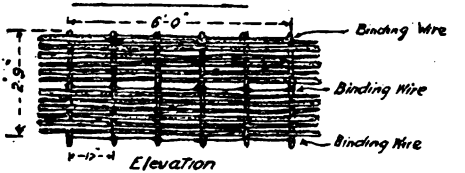
EXPANDED METAL OR WIRE HURDLE FOR CORNERS OF TRAVERSES



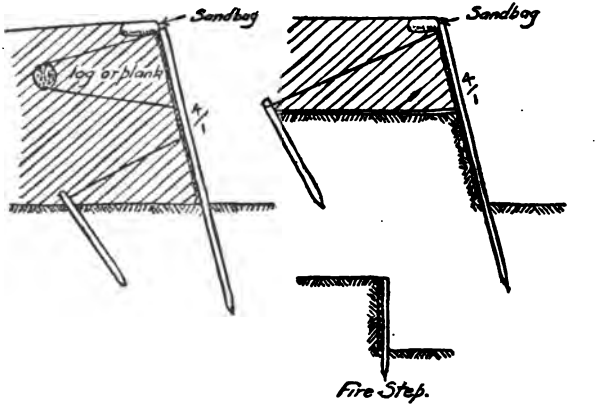
HURDLE MADE FROM OLD CEMENT CASKS.



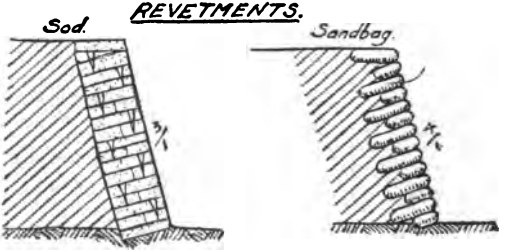
ROUGH HURDLE

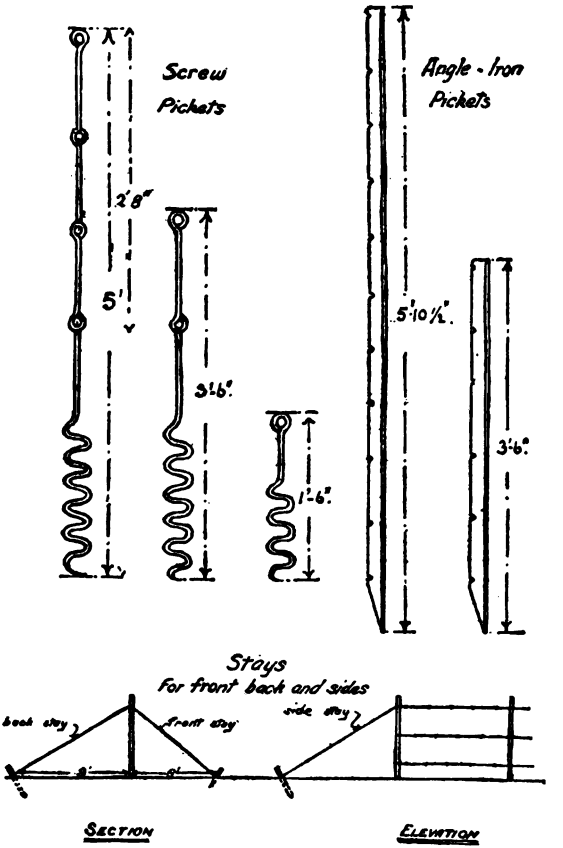


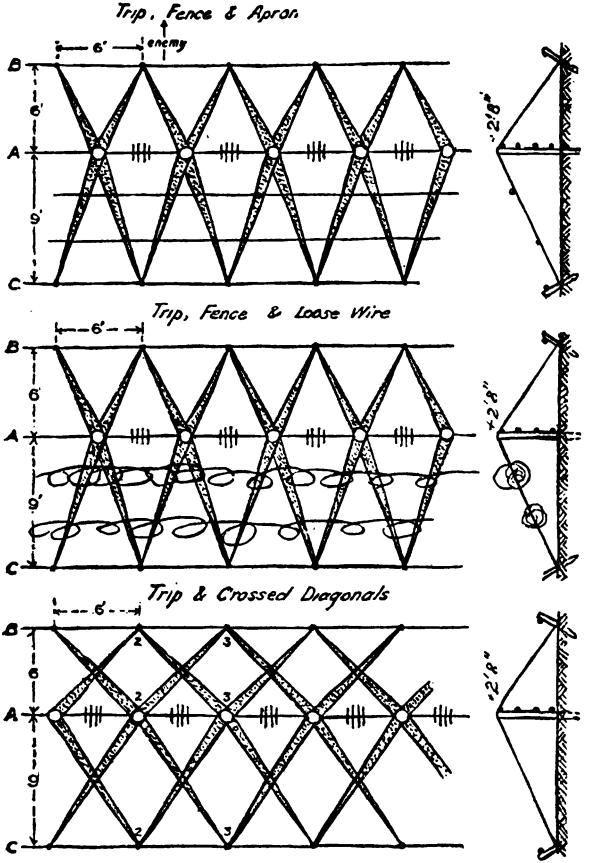
ANCHORAGES IN BREASTWORKS.

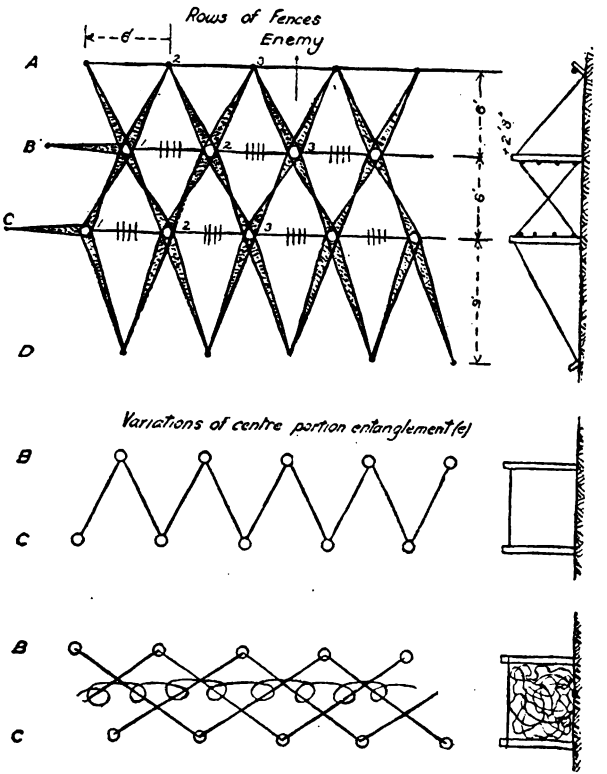


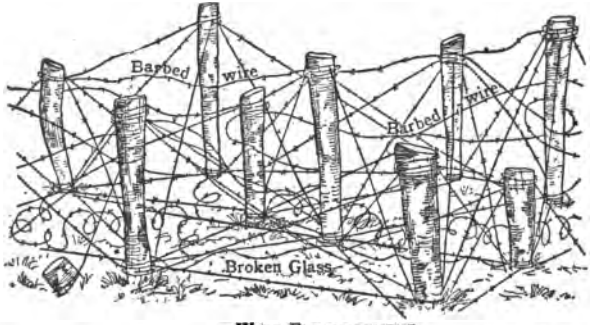
REVETMENTS.




Screw Pickets
2'8"
5'
3'6"
1'6"
Angle - Iron Pickets
5'10½"
3'6"
Stays
For front back and sides
back stay
front stay
side stay
Section
Elevation


Trip, Fence & Apron
6'
enemy
B
6'
A
9'
C
2'8"
Trip, Fence & Loose Wire
6'
B
6'
A
9'
C
2'8"
Trip & Crossed Diagonals
6'
B
6'
A
9'
C
2
3
2'8"


Rows of Fences
Enemy
6'
A
B
C
D
1
2
3
6'
6'
2'3"
5'
Variations of centre portion entanglement(s)
B
C
B
C



—WIRE ENTANGLEMENT.

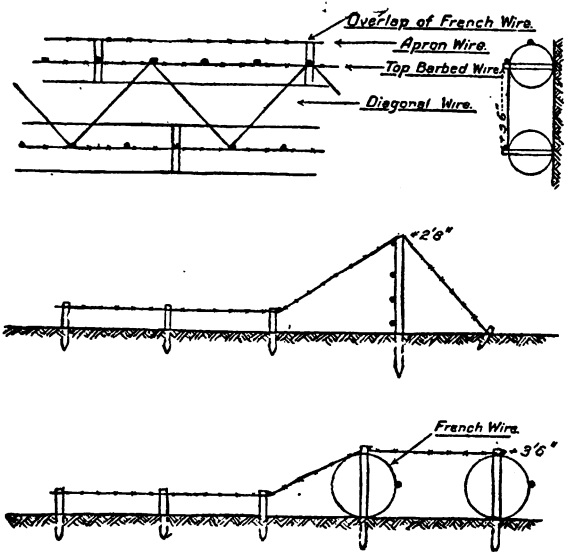
Posts.—**All heights up to 6 feet** out of the ground. Material: wood, 5 to 6 inches diameter, or steel posts* of any kind. Should be coloured to **harmonize with surroundings** before wiring begins. Spaced irregularly —average, **5 to 8 feet apart**. Very firmly driven, and anchored by **side-stays.**

Wire.—All kinds, including one or two very strong cables or chains, if available. Preferably barbed, and the thicker the better. The thickest wires next the enemy. The wire should not remain brightly galvanized, but be dulled or passed through paint before use. All wires well stapled and secured to the posts at varying heights.

Add dangling fish-hooks if available.

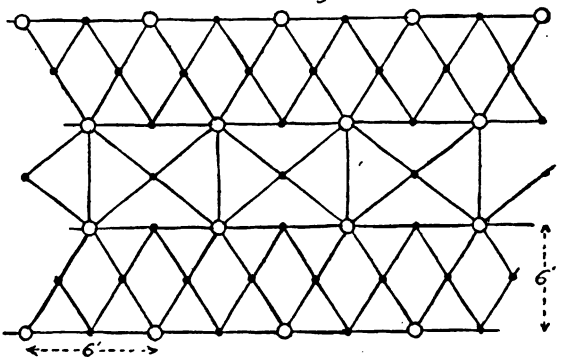
* A minor objection to steel posts, which applies also to all forms **of steel fencing,** is that they intercept and deflect a proportion of the defenders' **bullets, which** would pass freely through wooden posts.

Combination of French Wire low wire etc.

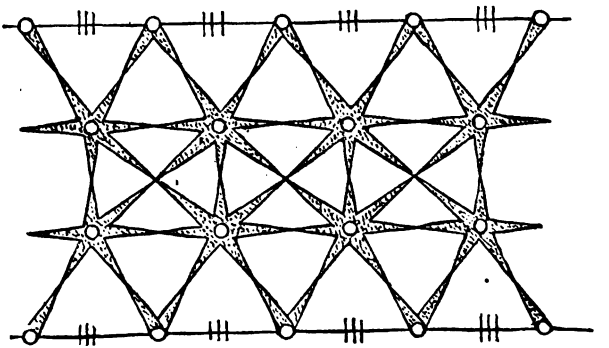


Combination of high & low Wire

(I). First Stage

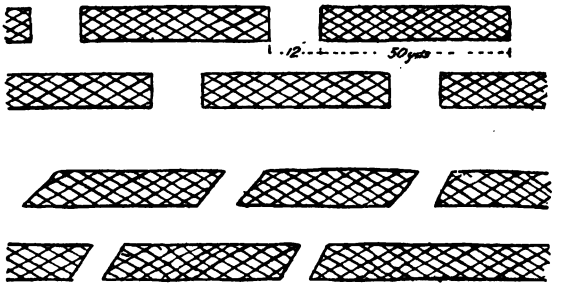


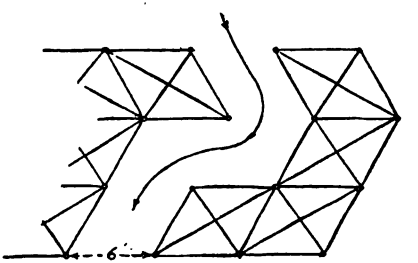
(II) Second Stage



GAPS IN ENTANGLEMENTS.

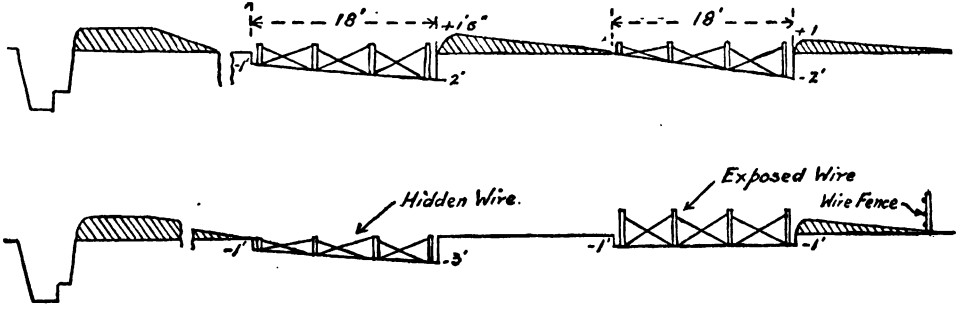
Not to Scale.



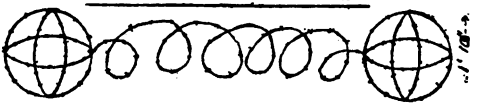


There should be "knife rests" or other obstacles handy for blocking gaps.

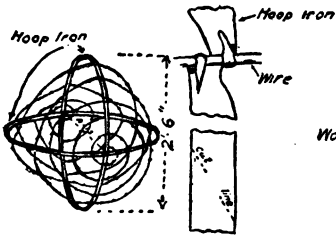
SUNK OR "DUG IN" WIRE ENTANGLEMENTS.
Not to scale.



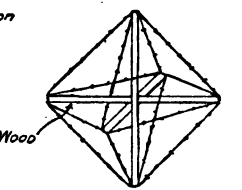
BARBED WIRE "GOOSEBERRIES"



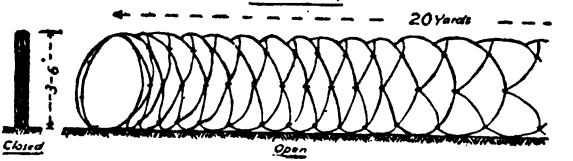
GOOSEBERRY
WITH HOOPIRON FRAME



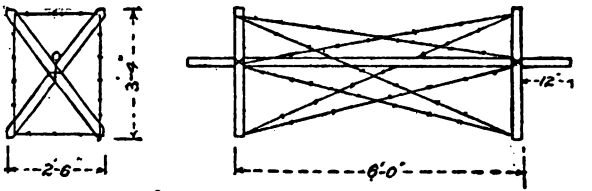
HEDGEHOG



FRENCH WIRE (CONCERTINA WIRE)
(Plain Wire)

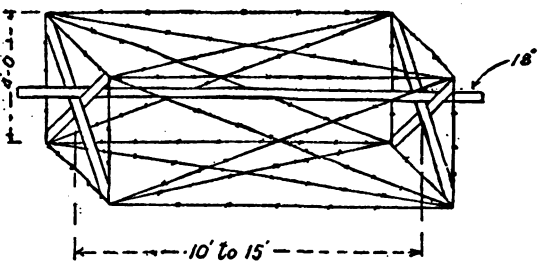


SMALL KNIFE REST.

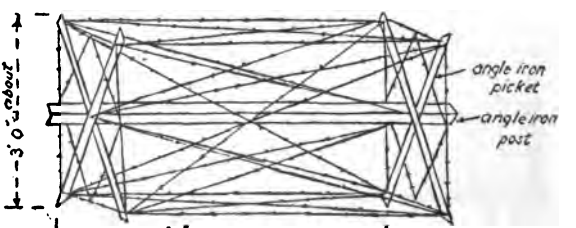


Spiral wire can be added

LARGE KNIFE REST

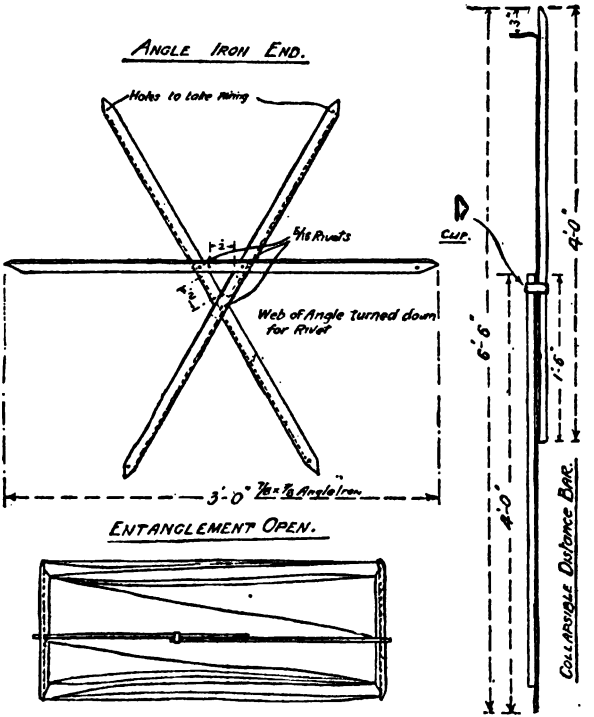


KNIFE REST WITH IRON FRAMEWORK



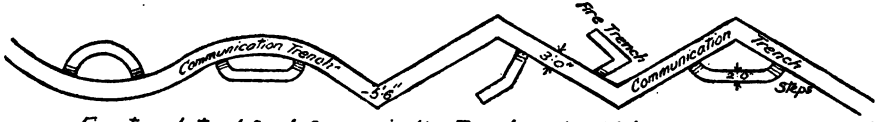
or about 8' 6" by using two 5' 10½" posts.

COLLAPSIBLE PORTABLE ENTANGLEMENT WITH ANGLE IRON ENDS.



TO COLLAPSE ENTANGLEMENT.
Run Clip to one end.
Remove Centre Bar
and close ends by a circular movement.

Methods of Defence of Communication Trenches



Fire Trench to defend Communication Trenches should be made as indicated above rather than by widening the Trench and cutting a fire step.

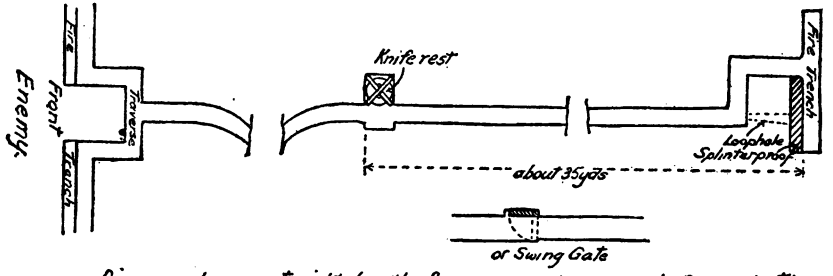
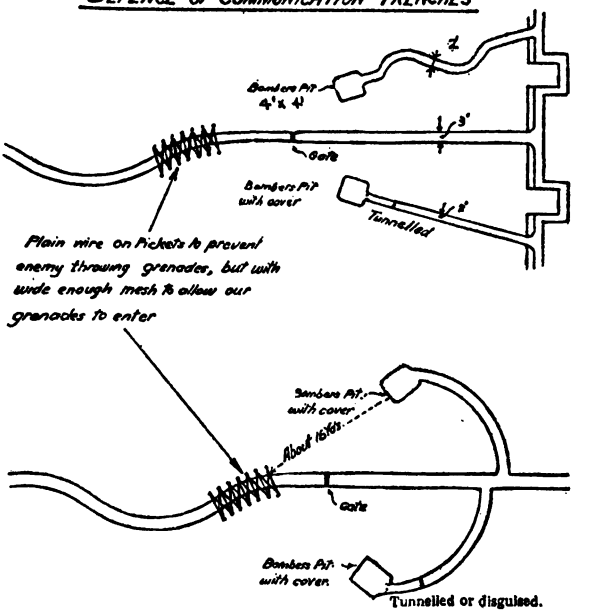
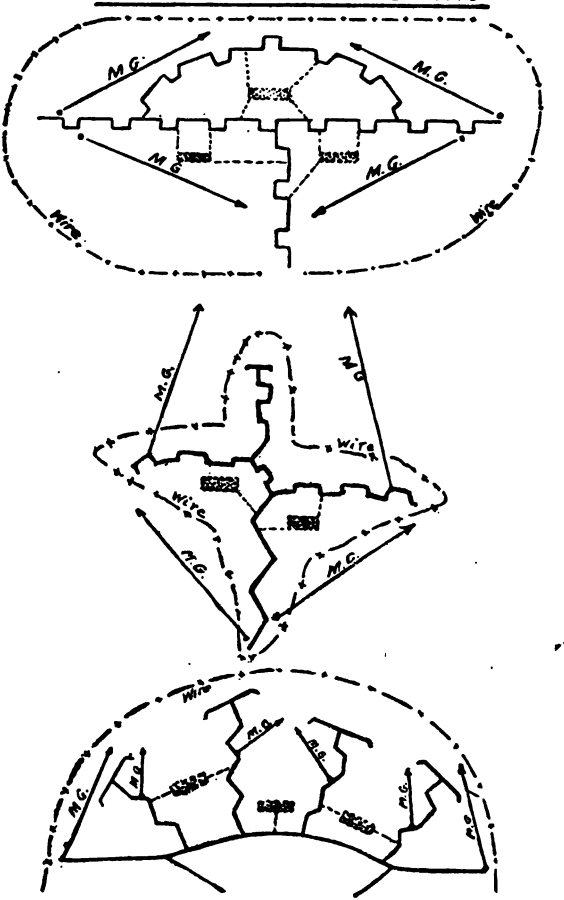


Diagram shewing straight length of communication Trench, for protection against bombing, and Knife rest in position for blocking

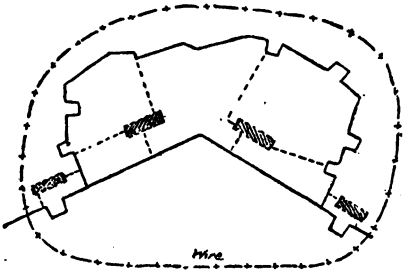
DEFENCE OF COMMUNICATION TRENCHES

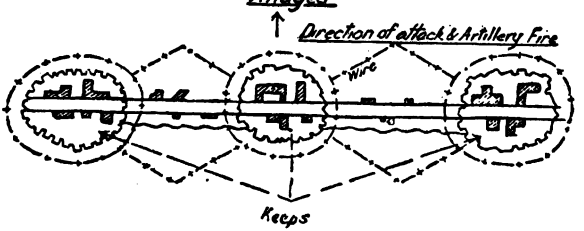


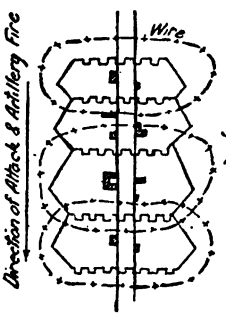
TYPES OF TRACE OF STRONG POINTS



Type of Trace for Strong Point



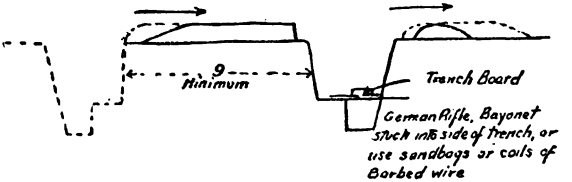




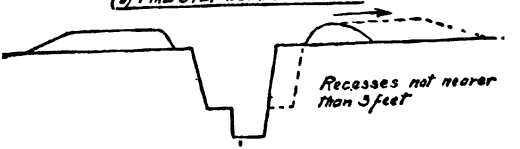
METHOD OF UTILIZING ENEMY TRENCHES.

(a.) FIRE STEP BEHIND PARAPET OR PARADOS.

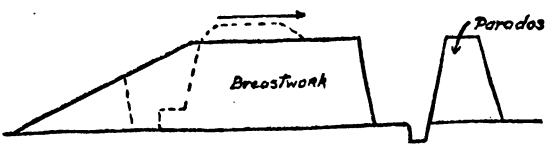
The dotted lines show the work to be done.



(b) FIRE STEP BEHIND PARADOS

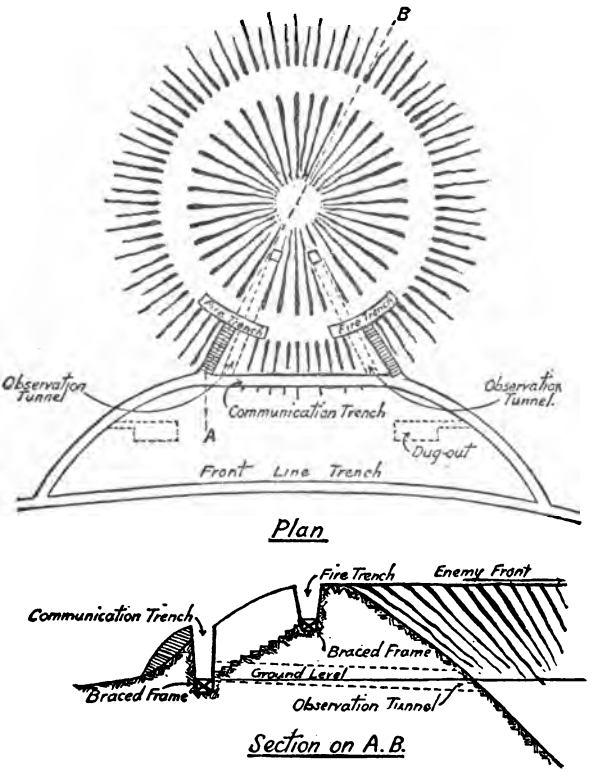


(c) BREASTWORK.



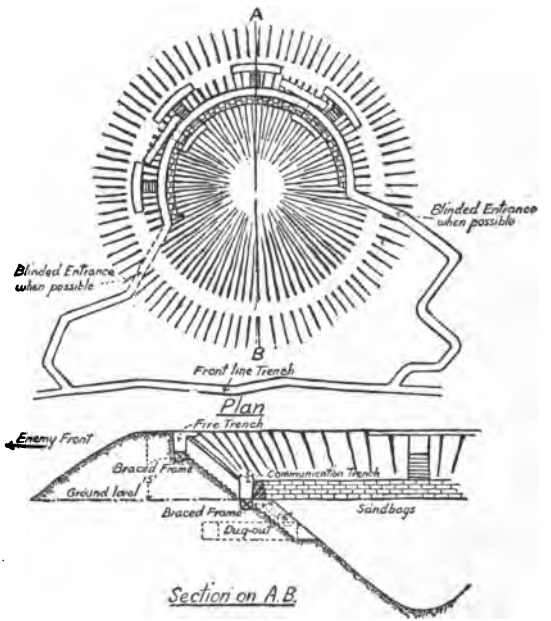
DEFENCE OF CRATERS.

(*a*) Near Lip Defended.



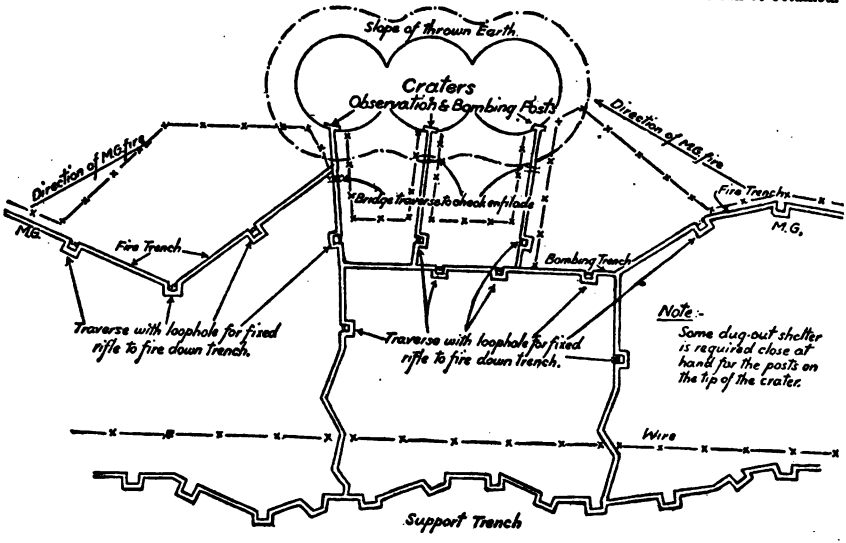
DEFENCE OF CRATERS.

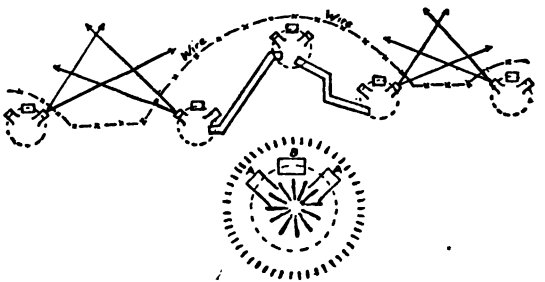
Far Lip Defended.



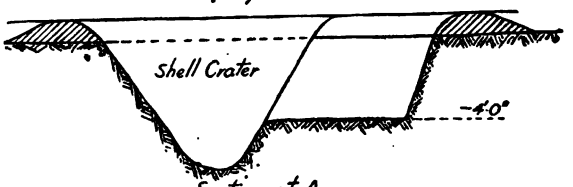
DEFENCE OF CRATERS.

Showing proposed system of defence by bombing trenches behind craters when no field of fire can be obtained.

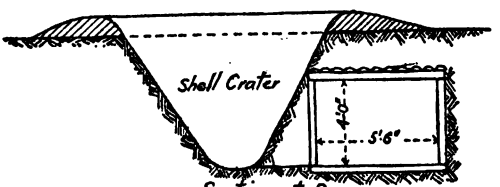




Plan of Defended Shell Craters



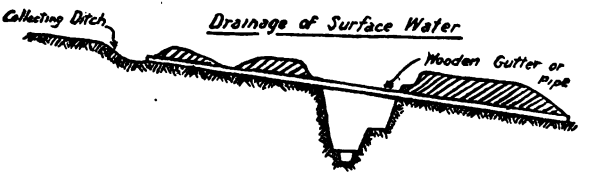
Section at A.



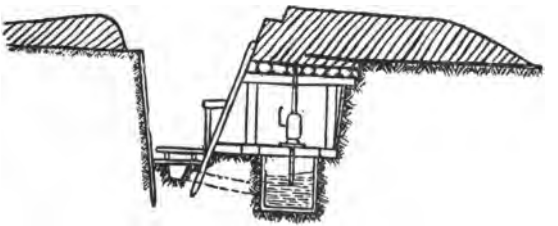
Section at B.

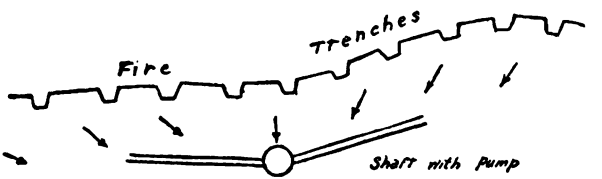
Drainage of Trenches

Removal of Collected Water.

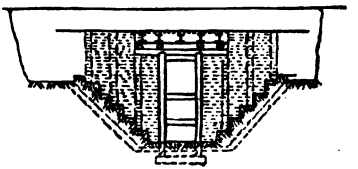


Pumping

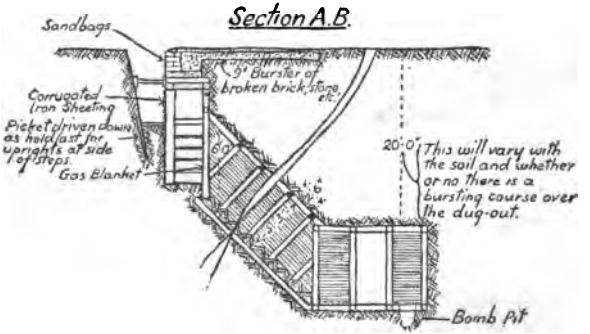




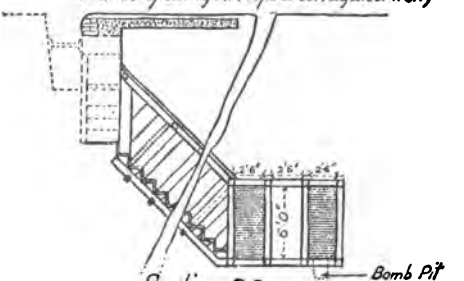
TYPICAL DUG-OUT.
Scale 1 in. = 12 ft.



Section A.B.



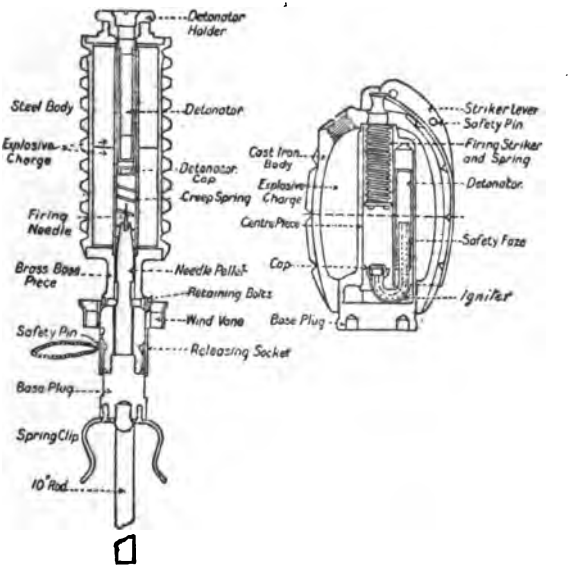
Section C.D.
Method of using Pit Props & Corrugated Iron)

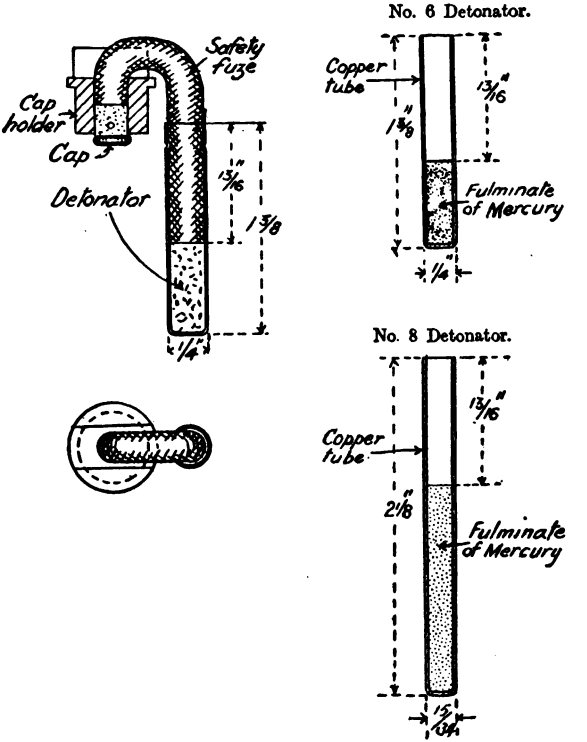


Section C.D.
Alternative Method using 12" Planks

GRENADE, ·303" SHORT RIFLE. No. 3.

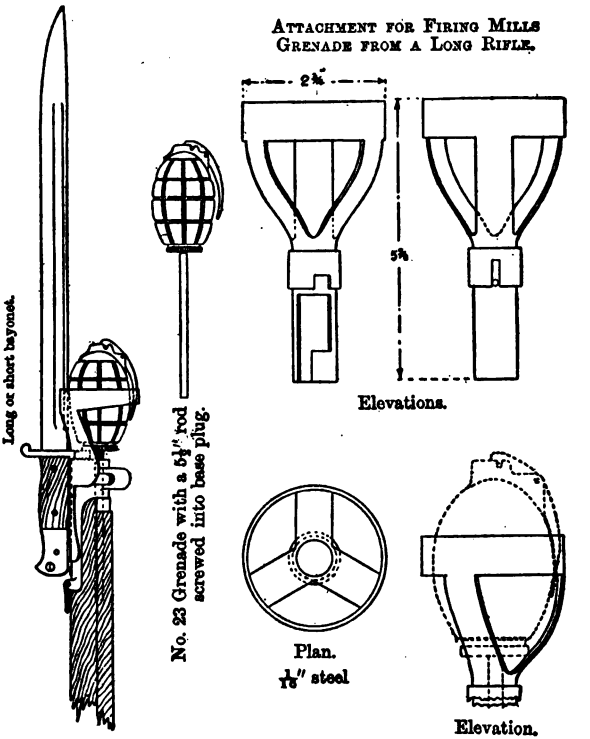
"MILLS" GRENADE, HAND. No. 5.





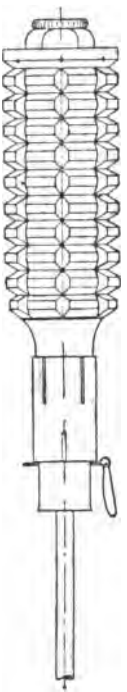
FOR NO. 5 AND NO. 23 (MILLS HAND AND RIFLE GRENADES).

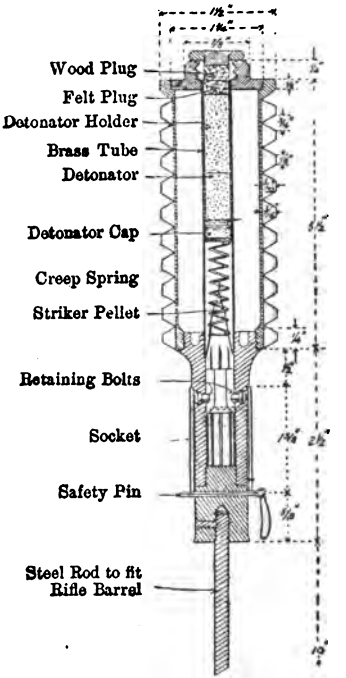
ATTACHMENT FOR FIRING MILLS GRENADE FROM A RIFLE.



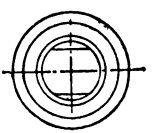
VANELESS RIFLE GRENADE, No. 20.

Elevation.



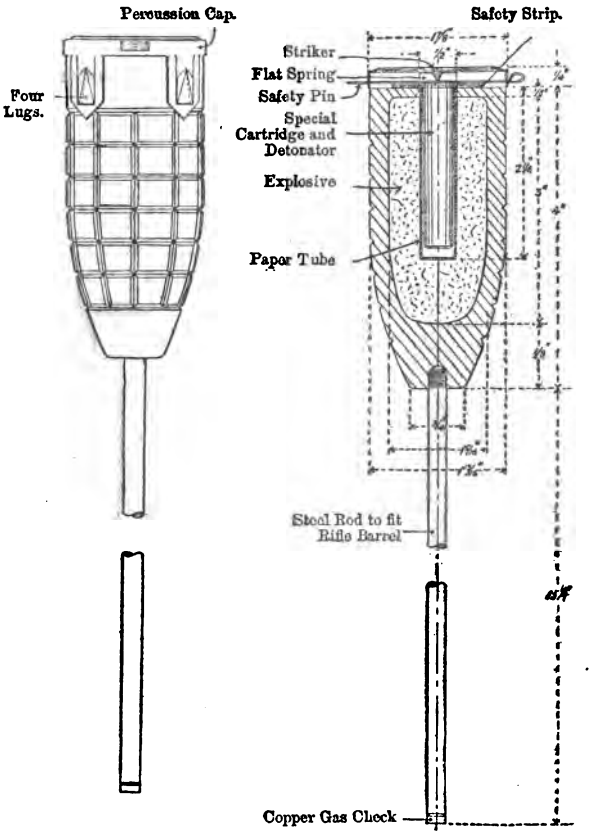


Section.



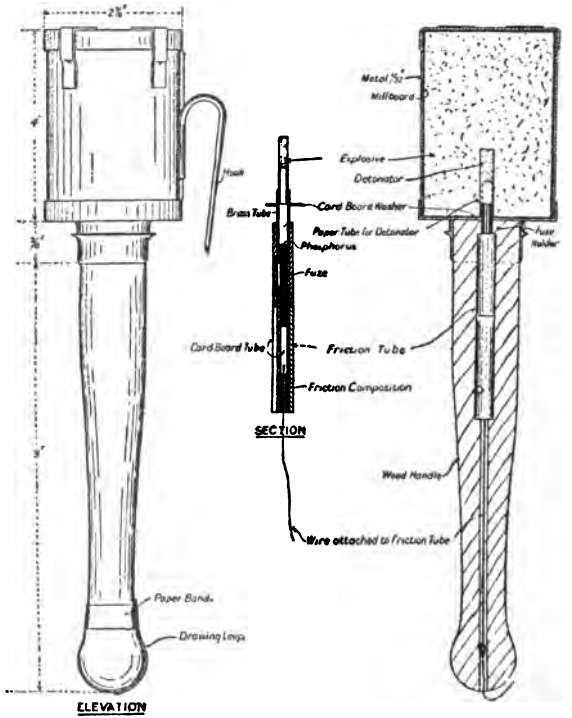
Plan.

Pippin Rifle Grenade, No. 22.

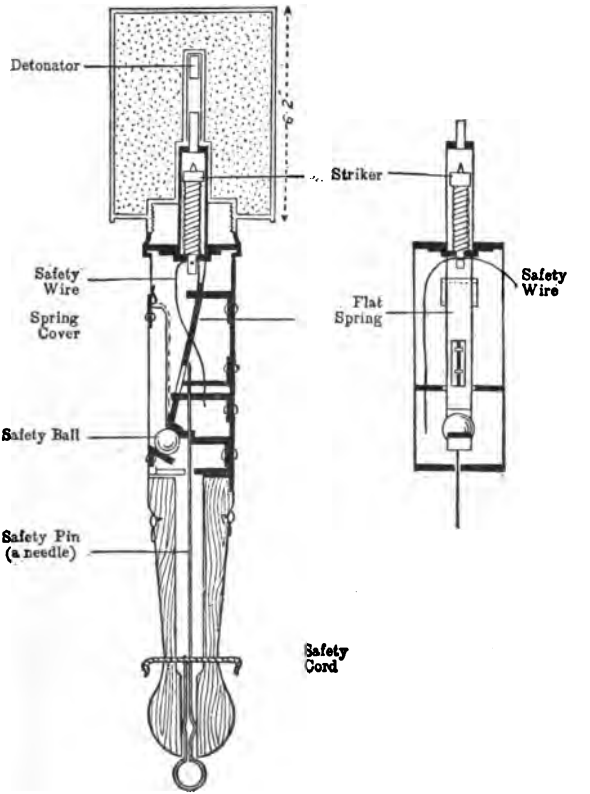


GERMAN CYLINDRICAL HAND GRENADE.
With handle (earlier type).

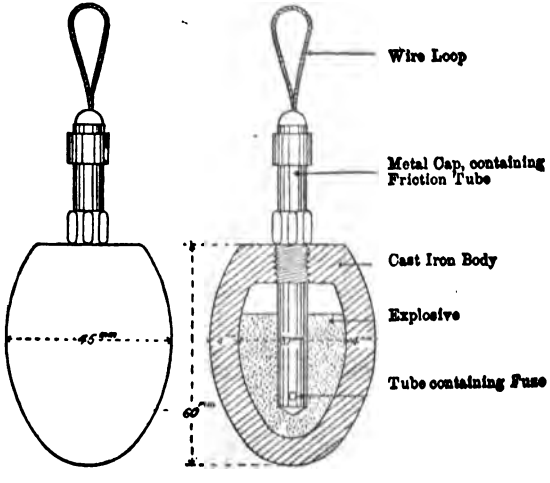
Section.



GERMAN GRENADE.
CYLINDRICAL HAND GRENADE WITH HANDLE (PERCUSSION).

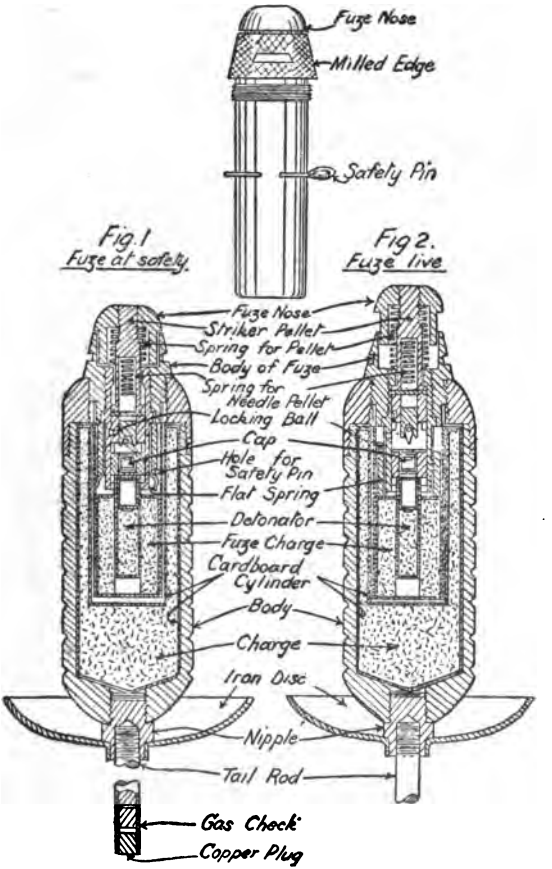


GERMAN EGG HAND GRENADE.



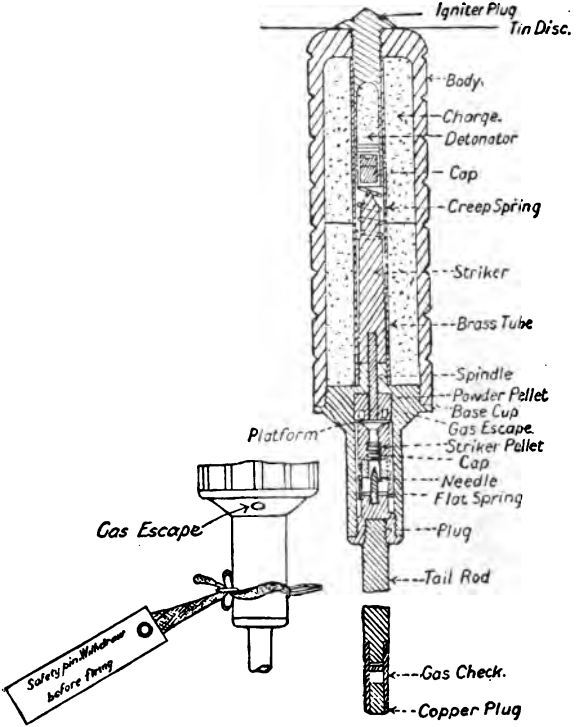
GERMAN RIFLE GRENADE, 1914.

Fuze.



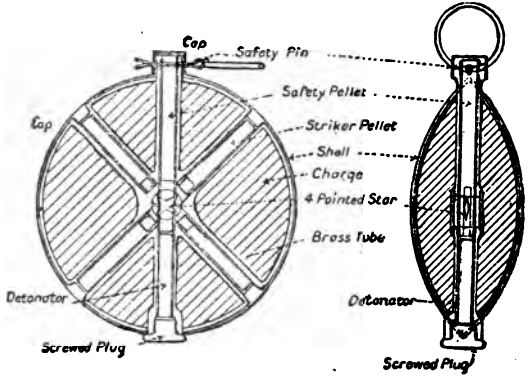
GERMAN.

Rifle Grenade, 1913.



To show safety pin in latest pattern.

GERMAN
DISC HAND GRENADE



German Spherical Hand Grenade.

Fig. 1.

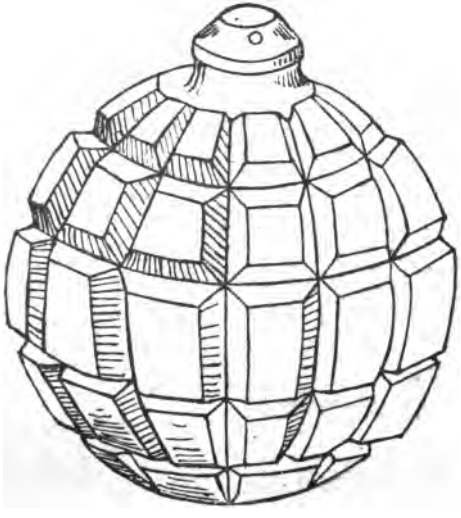
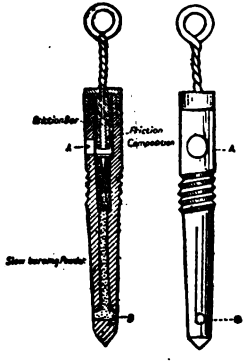


Fig. 2.

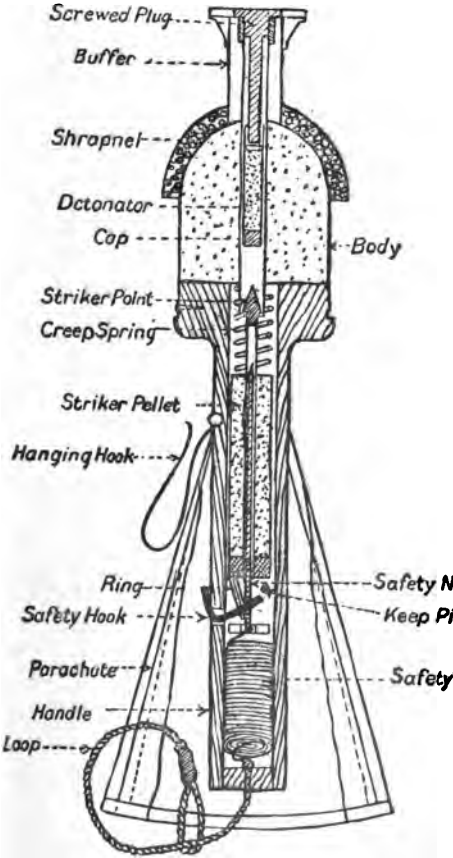


Section. Elevation.

Friction lighter.

GERMAN GRENADES.

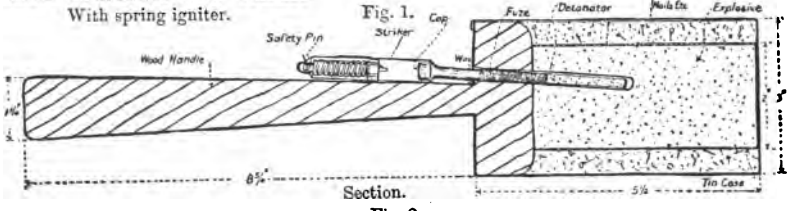
Parachute Hand Grenade.



German Cylindrical Hand Grenade

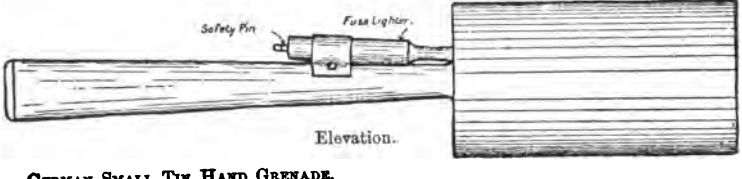
With spring igniter.

Fig. 1.



Section.

Fig. 2.



German Small Tin Hand Grenade.

Fig. 3.

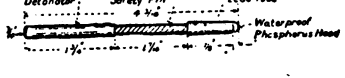
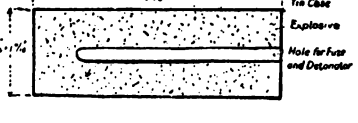


Fig. 4.



APPENDIX

APPENDIX

OFFICERS' EQUIPMENT ADVISED FOR FRANCE

Luminous wrist watch with unbreakable glass.
Revolver or pistol.
Field-glasses.
Periscope ($1.25).
Prismatic compass ($17.50).
Field message book.
Meat can.
Good white metal pocket flask.
Canteen (same as enlisted men use).
Wire-cutters (parrot nose).
Map case (waterproof).
Kit bag with lock (canvas); 18 inches in diameter; 3 feet 6 inches long.
Burberry coat, fleece-lined ($37.50).
Waterproof sheet.
One pair of ankle boots.
One pair of knee field boots.
One pair of puttees.
Four pairs of socks.
Washing and shaving things and towels.
Electric torch, small.
Writing materials.
Matches.
Tinder lighter (flint).
Canned heat with refills.
Strong clasp-knife.
Sleeping-bag.

Two sets of underclothing, medium weight.
Housewife.
Hold-all.
Two suits of olive drab.
Two suits of pyjamas.
One pair of long olive drab pants.
One pair of slippers or canvas shoes.
Knitted helmet.
Sweater, not too heavy.
One pair of large lined waterproof gloves.
Corkscrew and can-opener.
Pocket medicine case.
Pipe, waterproof (?) cigarette case.
Fountain pen.
Web belt.
"Sam Browne" belt.

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